Women's Doctoral Student Experiences and Degree Progress in Education versus Engineering

Author: Ann Katherine Masterman

BOSTON COLLEGE
Lynch School of Education

Department of
Educational Leadership and Higher Education

Program
Higher Education

WOMEN'S DOCTORAL STUDENT EXPERIENCES AND DEGREE PROGRESS IN EDUCATION VERSUS ENGINEERING

Dissertation
by

ANN KATHERINE MASTERMAN

submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy

May 2014

Abstract

Title: Women's Doctoral Student Experiences and Degree Progress in Education versus Engineering

Author: Ann K. Masterman

Directed by: Heather Rowan-Kenyon, Ph.D.

This study's purpose was to compare the lived experiences of doctoral women studying Education, a prototypically female field, with women studying Engineering, a prototypically male field to illustrate the phenomenon of doctoral degree progress in the two fields. Using critical feminist theory and Valian's (1999) concept of gender schemas, this study examined doctoral education culture in Education and Engineering and how these cultures influence women's doctoral student experiences and in turn their degree progress (Tong, 2009).

Although women represent over 50% of doctoral student enrollment and degrees earned, gender disparities exist in Education and Engineering. Once enrolled, women are proportionally more likely to complete Education doctorates and less likely to complete Engineering doctorates (Council of Graduate Schools, 2008; Gonzales, Allum, & Sowell, 2013; Nettles & Millett, 2006). This trend is important because it implies there is something about Education and Engineering doctoral environments that make them more and less conducive for women's success, respectively (Gardner & Mendoza, 2010).

This study used a qualitative interpretive phenomenological analysis (IPA) approach to capture the essence of women's doctoral degree progress by interpreting the lived experiences of 10 Education and 11 Engineering doctoral women (Smith, Flowers,

& Larkin, 2009). After 63 in-depth interviews and two focus groups, four themes emerged.

Overall, the Education women reported fewer positive doctoral experiences and more barriers to degree progress than the Engineering women due to the funding and research assistantship structure, the faculty advisor relationship, and the department environment. Both groups of women described doctoral education culture as proactive, independent, and competitive – characteristics more consistent with masculine gender schemas. Doctoral education culture also reflected the feminine gender schemas of flexibility and collegiality/collaboration, which were more apparent in the prototypically masculine Engineering field than in the prototypically feminine Education field. Implications for how doctoral education can be re-conceptualized, delivered, and researched are provided, calling for the incorporation of more feminine gender schemas into doctoral education culture in order to promote and achieve gender equity.

ACKNOWLEDGEMENTS

I am grateful to a number of individuals who have helped me along the way in my educational journey, including completion of this dissertation. First and foremost, I am grateful to my parents, Craig and Marjory Masterman, for enabling me to attend the University of Richmond, followed by Syracuse University where I earned my undergraduate degree. Without their emotional and financial support, I may not have been able to pursue advanced graduate study.

Also, I am thankful to my Master's degree advisor, Dr. Carol Anne Phekoo, for encouraging me to spread my wings and pursue a Ph.D. in Higher Education in the first place. I am looking forward to teaching in the Higher Education Administration program at the University of Miami next semester to give back to my Master's program and to Dr. Phekoo, whose mentorship and instruction prepared me well for doctoral study at Boston College.

Most importantly, I am thankful to my dissertation committee for their patience and encouragement throughout my doctoral program. To my dissertation chair Dr. Heather Rowan-Kenyon – you have been instrumental in my ability to complete this degree. Your valuable and timely feedback and guidance throughout the dissertation process has helped me better organize my thoughts and translate them onto paper. To Dr. Ana Martinez Aleman – your Philosophy of Higher Education class opened up my theoretical world and gave me a new found love of feminism and critical feminist theory. I realized in that class that the first step to achieving equity is to raise consciousness, first within ourselves, and then among other people and the social institutions that surround us. To Dr. Elizabeth Sparks – it has been a pleasure working with you during my tenure as President of the Graduate Education Association at LSOE. I loved our discussions

about how to improve graduate education, and I sincerely hope that this dissertation's findings can shed some light and provide practical value about how graduate schools of Education and Engineering can continue to support women (and men) doctoral students in pursuit of the doctoral degree.

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CHAPTER ONE: INTRODUCTION

Doctoral education is often touted as the crown jewel of the American higher education system because it is reserved for the most academically and intellectually capable (Golde, 2005). The purpose of doctoral education and the doctoral degree is "to prepare a student to become a scholar, that is to discover, integrate, and apply knowledge, as well as communicate and disseminate it" (Council of Graduate Schools [CGS], 1990, p.1). Doctoral degree completion signals educational attainment and serves as an authoritative mechanism for entry into certain professions, including the academic profession of research and teaching at American colleges and universities. Doctoral education is fundamental to the mission of American research universities where novice doctoral students learn to generate, transform, and disseminate knowledge for society's consumption. Not only is doctoral degree attainment representative of the productivity and efficiency of America's postsecondary education system, but also these highly-educated individuals significantly contribute to our country's ability to remain economically and socially competitive in today's knowledge-based global economy (CGS, 2005).

Despite the fact that doctoral education is reserved for the most academically and intellectually capable, doctoral degree persistence and completion continues to be problematic in the United States. Studies conducted across the last three decades indicate that approximately 40 -50% of doctoral students who are admitted into doctoral programs do not finish the degree (Bair & Haworth, 1999/2004; Bowen & Rudenstine, 1992; CGS, 2007; Lovitts, 2001; Most, 2008; Nettles & Millet, 2006). The bulk of the research suggests that the majority of students who enter doctoral programs have the academic ability to complete the degree, since degree completers and non-completers do not differ significantly

in undergraduate GPA, Master's GPA, GRE scores, and academic major when beginning their doctoral programs (Bair & Haworth, 1999/2004; CGS, 2007; Maher, Ford, & Thompson, 2004; Malone, Nelson, & Nelson, 2004). This suggests that inherent intelligence and academic aptitude are not the primary reasons why some students progress and earn the doctoral degree and other students do not. Instead, individual factors such as student motivation and psychosocial well-being, as well as institutional factors related to the climate of the academic discipline/field and department are the best predictors of the quality of the doctoral student experience and variations in degree progress (Bair & Haworth, 1999/2004; CGS, 2009; Gardner & Mendoza, 2010; Girves & Wemmerus, 1988; Golde, 2000/2005, Golde & Dore, 2001, Golde & Walker, 2006; Green, 1997; Lovitts, 2001; Walker, Golde, Jones, Bueschel, & Hutchings, 2008).

Departmental culture is particularly important to study as an institutional factor affecting doctoral degree progress because it is something institutions can directly control**;** departmental culture is often guided by and a reflection of the norms and expectations of the academic disciplines in which the faculty within the department situate themselves (Hirt & Muffo, 1998). The *Carnegie Initiative on the Doctorate (CID)*, a multi-institutional study of doctoral education in six disciplines, compiled a series of essays about the future of doctoral education. One essayist, Thomas Bender, emphasizes the importance of studying department culture to better understand the doctoral experience. He writes, "in fact I am convinced that the hidden curriculum embedded in the department culture is of enormous importance in the intellectual and professional formation of doctoral students" (Bender, 2006, p. 304-305). In sum, in order to better understand the doctoral experience, the institutional context in which that experience

occurs must be considered since disciplinary and departmental culture inevitably shape, and are shaped by, doctoral students' experiences.

Doctoral education used to be an arena where men dominated in terms of enrollments and degree recipients since the first doctoral degree was awarded by Yale University in 1861 (Thelin, 2004). Over the last thirty years women have progressed from representing the minority of doctoral enrollments and degree recipients in the United States to now representing the new majority—women's enrollment and share of doctoral degrees earned increased from 25% in 1976-1977 to just over half (51.2%) of the 449,000 doctoral students enrolled and 52.2% of the 67,220 doctorates awarded in 2011-2012 (Gonzales, Allum, & Sowell, 2013; Snyder, Dillow, & Hoffman, 2009). Women are now the majority at all levels of higher education – bachelors, master's, and doctoral levels. This suggests that overall women's access to, experience in, and completion of doctoral education is not a contemporary problem. However, women have only recently become the majority in doctoral degree enrollments and attainment, and these aggregate statistics ignore the pervasive gender disparities that exist within academic disciplines.

Problem Statement

Even though women represent over 50% of doctoral student enrollments and degrees earned in the United States, gender disparities exist most prominently in the science, engineering, and mathematics (SEM) and Education fields (Gonzales, Allum, & Sowell, 2013). In particular, Engineering and Education are two of the most highly gender-stratified fields for doctoral study. In 2012, men comprised 77% of doctoral enrollments and earned 78% of the doctoral degrees awarded in Engineering, whereas women represented 68% of doctoral students and earned 68% of the doctoral degrees in

Education (Gonzales, Allum, & Sowell, 2013; National Science Foundation [NSF], 2014). Tenure-track faculty within Engineering and Education mimic these same proportions. Women represent just 11% of full-time Engineering faculty but represent 61% of full-time Education faculty (NCES, 2010; NSF, 2008; The Almanac of Higher Education, 2010). These aggregate percentages demonstrate that Engineering is a male-dominated field, and Education is a female-dominated field for doctoral study.

However, the percentage of doctoral students enrolled who eventually complete the doctoral degree, in particular the percentage of men versus women within the same field, may be a more accurate indicator of gender inequity in doctoral degree progress and completion. Once enrolled, women are more likely than men to complete doctoral degrees within 10 years of admission into doctoral study in Education (54% women vs. 49% of men), whereas in Engineering, men are more likely to complete doctorates (65% of men vs. 56% of women), and these differences were statistically significant (CGS, 2007/2008; Nettles & Millett, 2006). This trend is important in that it implies that there may be something about the culture of the Education and Engineering fields that make them especially conducive for women's and men's success, respectively.

One of the reasons to explain why women continue to be disadvantaged in degree attainment in the male-dominated SEM fields is the "chilly climate" of academia where women undergraduate and graduate students have faced a number of barriers in access to, experience in, and completion of higher education at all levels (Hall & Sandler, 1982; Martinez Aleman & Renn, 2002; Moyer, Salovey, & Casey-Cannon, 1999; Thelin, 2004). Hall and Sandler originally coined the term "chilly climate" to describe the ways in which women were differentially treated in the classroom by professors based on their sex, and the

ways in which the differing expectations for men and women can affect the educational process. Women's under-representation in doctoral degree enrollments and completion is in part a result of the competitive nature of the graduate school experience and the oppressive culture of SEM towards women (Ferreira, 2003; Hirt & Muffo, 1998; Moyer, Salovey, & Casey-Cannon, 1999). In particular, the norms in which SEM disciplines function are "prototypically male" (Eisenhart, 1994, p. 193) and may be incompatible with the reality of women's lives. In particular, SEM fields are considered "prototypically male" fields (PMFs) because the environments of these "communities of practice" and measures of productivity in SEM are based on masculine definitions of success (Ferreira, 2010; Martinez Aleman, 2008). SEM departments tend to embrace objectivity and competition, and are atmospheres which lack collegiality, and do not encourage diversity as reflected in the few number of women faculty working in SEM research labs. Those women who are attracted as professionals or faculty in SEM display characteristically "male" behaviors as the standard for success (Eisenhart, 1994; Ferreira, 2010). Engineering is of particular interest as a PMF because it is the most highly gender-stratified field - more than 3/4 of Engineers, and Engineering doctoral students and faculty are men – and was the highest degree producing doctoral field in 2011-2012, accounting for 13.6% of the total number of doctoral degrees earned that year (Gonzales, Allum & Sowell, 2013; NSF, 2014). Thus, Engineering doctoral programs appear to be doing the best job of successfully matriculating men through the doctoral system.

In comparison to male-dominated SEM fields, much less is known about women's doctoral experiences and degree progress in "prototypically female" fields (PFFs) and whether women face similar or distinct obstacles while progressing through

doctoral degree programs in PFFs as they do in PMFs. Education is defined a PFF because it is the second most highly gender-stratified field behind Engineering – slightly more than 2/3 of Education practitioners, doctoral students, and faculty are women ("The Almanac," 2010; NSF, 2014), and the underlying assumptions which guide Education practice and pedagogy are those historically associated with femininity and the female experience. In particular, deep-rooted assumptions about women and femininity portray women's knowledge and work as inferior to that of men (Martinez Aleman & Renn, 2002). Education is an important PFF to study because Education granted the second highest number of doctoral degrees as a field behind Engineering, accounting for 13.0% of all doctoral degrees awarded in 2011-2012, and women earn 69% of these Education doctorates (Gonzales, Allum, & Sowell, 2013; NSF, 2014). Drawing upon these national statistics, it appears that Education doctoral programs are doing the best job of matriculating women through the doctoral system.

Despite women's progress and recent emergence as the "new majority" in doctoral education both as enrolled students and degree recipients, women continue to face a multitude of barriers in terms of their access to, experience in, and progress towards earning the doctoral degree. Overall, the literature suggests that the gendered environment of the discipline and department is most important for understanding variations in doctoral students' experiences and degree progress (Gardner & Mendoza, 2010), but yet there is very little evidence to date that explicitly uses feminist theory to examine and critique these gendered norms, values, and expectations implicit in disciplinary and department culture which may explain why women are less successful

than their male counterparts masculine environments such as Engineering and more successful in feminine environments such as Education environments.

Study Purpose and Research Questions

The purpose of this study was to compare the lived experiences of doctoral women in Education, a prototypically feminine field, and doctoral women in Engineering, a prototypically masculine field. Using critical feminist theory and the concept of "gender schemas" (Bem, 1981; Valian, 1999) this study examines and critiques the gendered environment of doctoral education in Education and Engineering, women's doctoral experiences, and how the underlying gender schemas that shape doctoral education and the doctoral experience influence women's doctoral degree progress in the two fields. This study addresses three research questions:

1. What is the gendered environment of doctoral education like for women enrolled in doctoral programs in Education, a prototypically "female" field, and Engineering, a prototypically "male" field?
2. How do the experiences of women enrolled in doctoral programs in Education and Engineering influence their doctoral degree progress?
3. How does the support for and barriers to women's doctoral degree progress in Education compare to the supports for and barriers to women's degree progress in Engineering?

Overview of Conceptual Framework

This study will draw upon critical feminist theory, and Bem's (1981) and Valian's (1999) concept of *gender schemas* to form a gendered view of doctoral education culture and structure in order to describe and interpret the meaning of the doctoral experience for

women in Education and Engineering (Martinez Aleman & Renn, 2002; Tierney & Bensimon, 2000). Most of the existing literature utilizes socialization theory as a framework for understanding how doctoral student experiences affect degree persistence. Socialization theory describes the process through which newcomers acquire the knowledge, skills, and competencies required to assume a particular role as members of a group or community (Bragg, 1976; Tierney, 1997). However, socialization theory is insufficient for understanding the gendered nature of graduate student socialization because socialization theory assumes that the socialization process is the same for everyone. Critical feminist theory is a more appropriate lens for examining and interpreting women's experiences in highly gender-stratified fields like Education and Engineering because it views gender as a central organizing construct for interpreting the socialization process. The various norms and values which are inherent in the academic profession are the same norms and values that are inculcated into doctoral education culture, since one of the functions of doctoral education is to socialize doctoral students into the academic profession (Austin & McDaniels, 2006). The norms and values inherent in academic and doctoral education culture are shaped by gender schemas. A *schema* is a cognitive structure which people use to organize and perceive their experiences and the world around them (Bem, 1981). Gender schemas are schemas that society develops according to "implicit, or non-conscious hypotheses about sex differences" (Valian, 1999, p. 2). People use gender schemas to classify their behaviors and expectations to conform to culturally-created definitions of what it means to be "masculine" or "feminine." Consequently, gender schemas affect society's evaluation of both men and women's performance, often over valuing men's performance and under

valuing women's (Bem, 1981; Valian, 1999). These culturally created and defined gender schemas are therefore inculcated into disciplinary and departmental culture and structure and ultimately women's doctoral student experiences. Thus, understanding the role that gender schemas play in shaping the doctoral environment, and in turn women's doctoral experiences will help explain women's differential degree progress in Education and Engineering.

Researcher Perspective

My interest in this topic has grown throughout the last four years as a Ph.D. student studying higher education. While the research has underscored the importance of gender equity in SEM fields to fulfill America's economic priorities for remaining competitive with other countries in research and technological innovation, my perception is that these national initiatives assume that the way to achieve gender equity is to increase women's representation in SEM in the academic pipeline. Simply adding more women in SEM without examining the nature of SEM culture will not solve the gender equity problem. Research on better understanding women students in SEM does not address the masculine culture of SEM fields and does not provide any suggestions for ways to change this culture to make studying SEM more appealing for women in order to retain them. Also, as a woman doctoral student studying a feminized field such as Education, I am particularly concerned that women like me are "left out" of the conversations about gender equity in doctoral education because the assumption is that there is no reason for concern since women represent the majority of faculty, students, and doctoral degree recipients in Education. However, I continue to question the taken for granted assumptions about how doctoral education is conceptualized, delivered in

practice, and researched in prototypically feminized fields like Education. I believe Education doctoral degree programs are pressured to mimic the culture and structure of more masculine academic fields in order to maintain their legitimacy within the doctoral education landscape as a rigorous research doctorate. My goal in choosing this dissertation topic is to raise consciousness of these taken for granted assumptions, figure out what is working and what is not working for women in doctoral education in Education and Engineering, and in practice initiate changes which will improve the doctoral student experience and degree progress for both women and men.

Earning a doctoral degree was always a goal of mine, ever since I was an undergraduate student. My interest in the field of higher education grew out of my college experiences, and two years after receiving my bachelor's degree I decided to pursue a Master's degree full-time at a private institution in the Southeast. After working as a graduate assistant in Undergraduate Admission for four months, I was offered a full-time job in the Undergraduate Admission office and quickly transitioned to the life of a full-time professional and part-time student. I figured that having full-time professional experience and eventually a Master's degree would open doors for me to advance in my career and earn more money quickly. However, after working for two and a half years and earning my M.S. Ed., all I received from the senior admission staff was a nice pat on the back, instead of the change in title and salary bump I was expecting.

At this point, I began to think about when would be the right time to go back to earn my doctorate. My original intention was to work for a couple of years before deciding to earn a Ph.D., and I vowed to do so full-time. I confided in my advisor and professor, because my career goal was to be just like her – a professor of higher

education and an administrator for a master's or doctoral program in higher education. The Higher Education department at my current institution had received accreditation approval to offer an Ed.D. Degree in Higher Education Leadership, and the inaugural class for the program would start in four months. My decision to apply to the program was in part fueled by the inability to advance in my office and in part due to my unwillingness to experience the stress of trying to balance a full-time job while simultaneously pursuing a graduate degree again. I was accepted into the Ed.D. program in June to begin in the Fall semester and secured a graduate assistantship working with the Dean of the Graduate School. This graduate assistantship was the catalyst behind my overall research interest in doctoral degree completion, because one of my projects there was to do some background research on the Council of Graduate School's *PhD Completion Project*.

During my first semester in the Higher Education Leadership Ed.D. program, I quickly realized that I had "outgrown" the higher education program at my institution and I wanted a new experience. Also, at the time I thought I wanted to pursue a faculty career, and the advice colleagues and superiors had given me was to look into degree programs in Higher Education that offered the Ph.D. because it would offer me more career flexibility and is generally considered the superior degree in terms of difficulty and prestige. Thus, I began to look into the possibility of transferring to a Ph.D. program in Higher Education in November of my first year. I didn't have much money to conduct a national search of Ph.D. programs, so I settled on applying to only two programs. I was admitted into Boston College's Ph.D. program in Higher Education and moved up north to Boston the summer before my first semester in 2009.

From the very beginning, I was adamant that as a full-time student and a single woman with no children, I had no excuses for not putting my pedal to the metal and do whatever it took to complete the Ph.D. within 3.5 years, 4 years maximum, since I already had 6 credits under my belt that transferred over from my other institution. I sat down with my doctoral advisor before my first semester and developed a clearly delineated plan for finishing the Ph.D. degree as quickly as possible because of my desire to return to the higher education job market and continue my career advancement. I was ready to do whatever it took to make the Ph.D. happen. I knew that in order to be a faculty member or obtain a senior executive leadership position, I would need the Ph.D. at some point, and I know that as a 27-year old single woman, this was really the most ideal time I would be able to focus so intently on my academic work without distraction.

As a full-time student at BC, it was a challenge to maintain a balance between all of my academic, financial, and personal/social obligations. During the three and a half years I was a full-time student, I had a very busy life outside the walls of my doctoral program, both for financial and personal reasons. Like many of the 10 Education women in my study, I also worked between three and five part-time jobs, in addition to taking out loans, just to pay my bills and afford my personal/social obligations. In addition to my 20-hour per week research assistantship, I served as the President of the graduate student association in the graduate school of Education. This responsibility required that I devote another 15-20 hours per week answering emails, doing financial paperwork, planning and conducting meetings, and overseeing all of the internal and external operations of the organization. I also worked during winter and spring break at the recreation center on campus as a lifeguard and swim lesson instructor to earn extra money. I chose to

volunteer and advised two undergraduate student organizations at neighboring institutions in the Boston area. I also felt obligated to spend time with my friends and family while studying full-time, and was a part of eight weddings during the four years I was a full-time doctoral student. I feel as though I don't have a "right" to complain about these conflicting priorities because I made the conscious decision to take on many responsibilities at once and was able to balance all of them well. So, when I decided to go out on the job market after finishing the data collection for this dissertation, I thought "no problem, I can work full-time and finish up my analysis and write-up in less than a year. I believed I could do it all, because I had done before it in college, and as a master's student and a doctoral student.

I believe the struggle to balance competing responsibilities and fulfill these responsibilities well is especially true for women, including me. I believe women are expected to be successful in both the public sphere (as a doctoral student, researcher, scholar, student leader, advisor), as well as in the personal or private sphere (as a sister, a daughter, a girlfriend, a friend, a confidant, a role model). I have had countless colleagues, family members, friends, and significant others say to me "I don't know how you do it all, Ann. You must have super powers or something." Obviously I don't have super powers but I put a lot of pressure on myself to do everything well, or at least do my very best in everything that I do. I believe that many women doctoral students, whether they are studying full-time or part-time, struggle to maintain that "superwoman" persona, excelling both in the public sphere (as scholars, professionals) as well as in the private sphere (in the home), as well as in their personal relationships as mothers, spouses, sisters, daughters, friends, etc. Men typically don't struggle to excel in both spheres

because they are socialized to believe that their primary responsibility is excelling in the public sphere as wage earners.

It is common knowledge in my doctoral program that there are three things that faculty recommend to doctoral students that they do NOT do while in the dissertation phase of their doctoral program: don't move, take a full-time job, or have a baby, and yet it is precisely those three choices that are typical for most doctoral students in Education who are at the age where they need to move, work, or decide to have a family. I did two of those three forbidden things while in the dissertation phase of my doctoral program. My career goals began to change starting my third year as a doctoral student when I realized that I would have greater impact as an administrator in a role where I could forge a stronger relationship between research and practice because I understand that both are necessary for improving student success in higher education at all levels. Thus, I began searching for administrator-level positions.

In September 2012, I started a full-time Director-level job at an institution in the Southeast which required me to move. I decided to work full-time starting my fourth year in the doctoral program because I felt that I had been out of the job market for too long; also, I couldn't afford to take out another semester or year of loans to add to my already $150,000in student loan debt from my undergraduate, master's, and now doctoral degrees. During my doctoral program, my career goals had changed. When I made this decision to work full-time, the faculty were supportive. Two specifically said to me, "Ann, we know you're not going to have any problem finishing, because you have been very vocal about wanting to complete your Ph.D. as quickly as possible". Up until this point, I had been successful at completing what I had started within the timeframe I

originally had planned. However, after working full-time for a few months, I realized that my degree progress was going to suffer. It has taken me a year to write up the findings from this dissertation, and I felt like a hypocrite considering that my dissertation topic is women's doctoral degree progress. I have struggled with many of the same challenges as my doctoral colleagues who maintained full-time jobs. I was and still am disappointed in myself that it took me a year longer than I expected to finish this dissertation. I wanted to shed light on how difficult it is to strive to be that "superwoman" that society expects women to be within a more "masculine" template for success in doctoral education. That template for success expects that women complete their doctoral degrees within four or five years as full-time students. I struggled with making the decision while balancing the priority of finishing my PhD with the need to re-enter the higher education administration profession. I fully expected I could do it all at once – I expected that I could balance a full-time job and writing my dissertation at once because of my deep-rooted beliefs that what was true for most other doctoral students was not true for me, because I had done it before. What I didn't realize is that my expectations for myself were unrealistic.

I have struggled just like the women in my study struggled, but there have been women who have also been successful in completing their doctoral degrees while also managing other commitments such as careers, spouses, and motherhood. The nature of women's doctoral experiences and degree progress is a complicated issue that most people in American society don't understand because they haven't lived it – only 2% of the American population has earned a doctoral degree. My hope is that my telling the stories of these 21 women enlightens other doctoral women and graduate faculty and administrators about not only women doctoral students' struggles, but also their

successes. Education and Engineering doctoral programs appear to be successful in producing doctoral degree recipients, so my goal in writing this dissertation is to better understand my own doctoral experiences as well as what is working and what isn't working in doctoral education in order to make informed recommendations.

Overview of Study Design

In order to illustrate the nature of women's doctoral degree progress in Education and Engineering, I used a qualitative interpretive phenomenological analysis (IPA) approach which focuses on phenomenology, interpretation, and by design is idiographic (Smith, Flowers, & Larkin, 2009). The IPA approach is phenomenological because it focuses on the lived experiences of currently enrolled women doctoral students in order to capture the essence of the phenomenon of doctoral degree progress in Education and Engineering (Marshall & Rallis, 2006; Rossman & Rallis, 2003). This study is interpretive in that it focuses on uncovering meaning that the women make from their doctoral experiences and degree progress. Also, the design of this study is idiographic in that it is committed to understanding the specific experiences of individual cases. I employed a critical feminist perspective throughout the data collection, analysis and interpretation process in order to examine the gendered nature of doctoral education culture, women's doctoral experiences, and their relationship to women's doctoral degree progress. The final purposive sample consisted of 10 women doctoral students enrolled full-time at the Northeast University Education School (NUES), a graduate school of education in the Northeast, and 11 women enrolled full-time at the Northeast Institute Engineering School (NIES), a graduate school of engineering in the Northeast, in order to account for differences in enrollment status between the two fields (Patton, 2002).

Data were collected through 63 semi-structured one-hour interviews with the 21 women (10 Education and 11 Engineering women). I interviewed each woman three times to address her life history, current experiences, and the meaning made as a woman doctoral student; this three interview structure is common of in-depth phenomenological interviewing (Seidman, 2006). In addition, I conducted two 90-minute focus group sessions – 1 focus group of NUES women and 1 group of NIES women in order to identify the collective similarities and differences in experience and degree progress. The data from the 63 interviews and two focus groups was collected and transcribed between May and August 2012. I used a critical feminist perspective and socio-cultural approach to my analysis in order to interpret the meaning of the doctoral experience and identify the gendered aspects of doctoral environment and how this environment affected the women's doctoral experiences and degree progress both across and between the two groups of women. I used the holistic coding method to "chunk" the text from the individual interviews into three areas and transform the transcript data into a narrative summary for each of the 21 women (Saldana, 2009). To ensure trustworthiness and the credibility of my interpretations, I sent each of the 21 women their narrative summary to review and edit in order to ensure that my interpretations were an accurate representation of their experiences as they perceived them (Moustakas, 1994). These narrative summaries are presented in Chapter Four and Chapter Five.

I coded the 63 interview and two focus group transcripts to transform the data into initial codes. Then, I used focused coding to transform the codes into categories, followed by pattern coding to transform the categories into themes (Saldana, 2009). While coding, I focused on participants' descriptions of "what people say they do, what they are

actually observed to do, and the underlying (and often unconscious) belief systems that drive their behavior" which are the three levels of analyzing culture (Greenhalgh & Wessely, 2004, p. 199). The coding process yielded four major themes, each of which are presented in Chapter Six (Findings).

This dissertation study has three main limitations. First, the conclusions made about the doctoral experience and culture in Education and Engineering are based on information-rich cases of 21 women enrolled full-time in in doctoral degree programs in Education and Engineering at NUES and NIES, respectively. Thus, the findings will not reflect the experiences of women enrolled as part-time students in Education and Engineering doctoral programs. This is particularly important because in Education, 60% of all women doctoral students are enrolled part-time, whereas in Engineering, only 27% of women are enrolled part-time (Gonzales, Allum & Sowell, 2013). Selecting only full-time students allowed for a better comparison due to the effect that enrollment status has on the nature of the doctoral experience and degree progress. A second limitation is the findings reported are all based on the perception and interpretations of the 21 participants during a particular timeframe (May – August 2012). Thus, any changes in perceptions since the time of these interviews, focus groups, and the narrative summary presentations are not captured in these findings. Also, I acknowledge that my own preconceptions and doctoral experiences as a researcher and woman doctoral student are inextricably linked to my interpretations of these women's experiences. Finally, this study's design and findings address women's perceptions of their experiences, which might include male doctoral students in their doctoral programs; however, this study does not attempt to address men's perceptions of their experiences nor

does it make comparisons between men and women's doctoral experiences in Education or Engineering.

Study Significance

The study is significant in three ways. First, this study addresses the knowledge gap about women's doctoral experiences in female dominated fields like Education where women are overwhelmingly the "majority" in enrollments and degree recipients. Women's student experiences in female-dominated fields are largely understudied in higher education research in comparison to women in male-dominated fields such as Engineering (Committee on Science, Engineering, and Public Policy [COSEPUP], 2007). Second, feminist theory and research that is explicitly feminist is underrepresented in higher education as a framework through which researchers examine issues related to retention and persistence, particularly at the graduate level (Ropers-Huilman & Winters, 2011). Third, this study refutes the common assumption that women's doctoral degree experiences are more positive and women experience fewer barriers during doctoral study in female-dominated fields such as Education in comparison to women in male-dominated fields such as Engineering (Litzler, Edwards Lange, & Brainard, 2005; Maher, Ford, & Thompson, 2004). Thus, gender is a necessary and appropriate lens for interpreting women's doctoral degree experiences and understanding their degree progress in these two highly gender-stratified fields.

Implications for Theory, Practice, and Research

The findings from this study have theoretical, practical and research implications for students, faculty, and administrators who seek to better understand doctoral education in highly gender-stratified fields such as Education and Engineering and advocate for

change. This research prompts institutional leaders and researchers to revisit the theoretical taken for granted assumptions about the purpose and structure of doctoral education and its relevance inside and outside of academia. This research also raises consciousness among students, faculty, and administrators about the gendered nature of doctoral education as it exists within the context of the doctoral department and program, and how it affects women's doctoral experiences and degree progress. In practice, the findings from this study inform graduate student faculty and administrators about how best to support women's doctoral degree progress within the context of their department and doctoral program culture, and ensure that departmental and program policies reflect practices that are aimed to reinforce those supports and safeguard against the common barriers to doctoral degree persistence and completion. A comparison between Education and Engineering enables faculty and administrators in each field to learn from each other about how best to support women (and men) doctoral students with the ultimate goal of ensuring gender equity in the quality of the doctoral experience and degree progress and completion within the same field. This study also has implications for future research needed in order to better understand gendered doctoral environment and how societal gender schemas affect the doctoral environment and in turn women's doctoral experiences and degree progress.

Dissertation Outline

Chapter One provides an introduction to the reader, including the importance of studying women's doctoral degree experiences and degree progress from a feminist perspective. The second chapter reviews five major bodies of literature –doctoral education and degree progress in general, doctoral education in Engineering and

Education specifically, individual and institutional factors for doctoral degree progress and completion, women's doctoral degree progress and completion, graduate student socialization theory and its limitations for understanding the doctoral experiences of women, and the strengths of critical feminist theory and Valian's (1999) concept of gender schemas for explaining the ways in which doctoral education culture and structure is gendered and how these gendered environments differentially affect women's doctoral experiences and degree progress. The third chapter outlines the study's design, including the assumptions of critical feminist research and interpretive phenomenology, the methods for data collection, analysis, and presentation to answer the proposed research questions, and the study's limitations and implications for theory, practice, and research. Chapter Four provides a general description of the final sample of 21 doctoral women, and a narrative summary of the 10 Education women at NUES . Each narrative summary profiles the individual woman's motivations for pursuing doctoral study, their doctoral experiences, and their perceived supports and barriers to degree progress. Chapter Five includes the narrative summaries of the 11 Engineering women at NIES and their motivations for pursuing doctoral study, their doctoral experiences, and perceived supports and barriers to degree progress.

Chapter Six describes the four major themes that emerged from the data analysis using the participants' experiences and own words to illustrate each theme. Chapter Seven answers the three research questions that guided this study, and finally Chapter Eight summarizes the major conclusions and connects these findings to the existing literature on women doctoral students to illustrate how they refute the common assumption that women doctoral students studying prototypically female fields such as

Education do not struggle as much as women studying prototypically male fields such as Engineering. Chapter Eight also provides implications for how doctoral education should be re-conceptualized, delivered, and researched in the future given the conclusions of this dissertation.

CHAPTER TWO: REVIEW OF THE LITERATURE

Overview

The purpose of this literature review is to provide a critical overview of what is currently known about women's doctoral student experiences in Engineering and Education and how these experiences influence women's doctoral degree progress and completion. In order to understand women's doctoral degree progress in Engineering (often discussed as part of SEM disciplines) and Education, five areas of research must be addressed: 1) Doctoral degree progress and completion, including degree definitions and variations in degree completion in the Engineering and Education fields; 2) The current state of doctoral education in Engineering and Education ; 3) General factors affecting degree progress and completion; 4)Women's doctoral degree progress and completion in Engineering and Education, including women's unique individual, institutional, and socio-cultural barriers; and 5) Graduate student socialization theory and the relationship between doctoral education culture and academic culture . Socialization theory provides a limited understanding of women's doctoral student experiences and degree progress in highly gender stratified fields such as Engineering and Education because the theory assumes that the socialization process is uniform for everyone. Instead, critical feminist theory and the concept of "gender schemas" are used to examine the gendered nature of doctoral education culture, particularly in Education and Engineering, as a potential explanation for women's differential doctoral degree progress in those fields.

Doctoral Degree Progress and Completion

Doctoral Degree Definitions

First, a conceptual definition of what constitutes a doctoral degree and doctoral degree completion and attrition in Engineering and Education must be provided as it will be discussed in this literature review. The doctoral degree is the highest degree awarded in the United States higher education system and represents the terminal degree in most academic disciplines and fields of study (Gardner, 2009a). The doctoral degree is "designed to prepare a student to become a scholar, that is to discover, integrate, and apply knowledge, as well as communicate and disseminate it" (CGS, 1990, p.1). Thus, the doctoral degree is first and foremost a research doctorate requiring that students engage in intellectual inquiry and generate new knowledge. Typically, the contribution of new knowledge through research takes the form of an academic thesis or dissertation as its culminating activity (CGS, 2005).

The Ph.D. (Doctor of Philosophy) is the most common type of doctoral degree and comprised 98% of all doctorates earned in the United States in 2012 (NSF, 2014). According to the national *Survey of Earned Doctorates (SED)*, a research doctorate is defined as a doctoral degree which prepares individuals to make contributions to the existing knowledge base, requires the completion of a dissertation as part of the degree requirements, and is a degree "not primarily intended for the practice of a profession" (NSF, 2014, p. 13). Thus, the research doctorate does not include professional degrees such as the M.D., J.D., or the Psy. D. since these degrees prepare individuals to work in the professions of medicine, law, and psychology, respectively, and do not include a formal academic thesis or dissertation as part of the degree requirements (Gardner, 2009a; NSF, 2010).

The SED recognizes 18 types of research doctorates. In both Engineering and Education, sometimes research-orientated, dissertation-requiring doctoral degrees are given other designations. In Engineering, the primary type of research doctorate awarded is the Ph.D., but research doctorates also include the Sc.D. (Doctor of Science), D.Eng. (Doctor of Engineering), and D.Esc. (Doctor of Engineering Science) degrees. However, these types of degrees are quite rare and represent less than 1% of all research doctorates awarded. (Gardner, 2009a; NSF, 2014). In Education, sometimes the research doctorate awarded is the Ed.D. (Doctor of Education). The Ed.D. is the second most commonly-awarded research doctorate after the Ph.D. and accounted for 1.3% of all research doctorates awarded in 2012 (NSF, 2014). For the purposes of this literature review, all research-intensive, dissertation-requiring doctoral degrees which the *SED* classifies as a "research doctorate" will be referred to as a "doctoral degree." This literature view focuses on doctoral degrees pursued and earned within the broad fields of Engineering and Education.

Degree Persistence and Completion

Doctoral degree persistence and completion is an all-encompassing concept to describe the event of completing all the necessary requirements as stated in a doctoral-degree granting program from a regionally accredited institution of higher education. Doctoral degree completion occurs when a doctoral candidate satisfies all of the requirements of his or her doctoral degree, which for research doctorates include the successful completion of a research-based dissertation and a successful defense of the research in front of a panel of faculty members who are experts in the discipline area(s) addressed in the thesis/dissertation (Gardner, 2009a). The department awards the doctoral

degree after completion of a successful thesis/dissertation defense and submission of the final written document which is approved by the designated faculty committee is evidenced in the institutional and departmental records.

There is great variety in the literature on doctoral degree completion across disciplines, institutions, and departments as to the timeframe in which students are allotted to complete the doctoral degree. The Council of Graduate Schools (CGS) conducted the most current national study of doctoral degree completion to date as part of its *Ph.D. Completion Project*. The CGS (2007/2008/2009) time frame for determining completion or non-completion is operationalized as ten years beginning when the student is admitted into the doctoral program and begins his or her first course in the program and ending when the student successfully defends and submits a completed written thesis/dissertation document. Thus, students who are enrolled in a doctoral program and have not completed the dissertation as well as those who have left their doctoral programs within or after 10 years are both considered "non-completers," whereas students who finish the doctoral degree in 10 years or less are considered "completers," regardless of the total time it takes them to complete the doctoral degree. Ten years will be used as the timeframe when referring to doctoral degree completion in this literature review.

Studies conducted across the last three decades at multiple higher education institutions indicate that about half of all students who enroll never complete the doctoral degree (Bair & Haworth, 1999/2004; Bowen & Rudenstine, 1992; CGS, 2007; Lovitts, 2001; Most, 2008; Nettles & Millet, 2006). CGS (2007/2008) conducted the most recent comprehensive national study documenting doctoral degree completion and attrition rates for three cohorts of over 49,000 doctoral students entering doctoral programs between

1992 and 1998. The doctoral degree programs included in the study were "research doctorate" degrees, mainly the Ph.D., across 62 disciplines at 24 research institutions in the United States and Canada. CGS concluded that by the 2003-2004 academic year, 57% of students entering 1992-1995 completed the doctoral degree within 10 years and 42% of students entering in 1995-1998 completed within seven years after admission into doctoral study. However, significant disparities exist in completion rates by broad field, with students in SEM fields having higher completion rates and social sciences and humanities (SSH) fields having the lowest rates (CGS, 2007). Doctoral degree completion rates in Engineering are the highest of all fields with 64% completing within ten years. Education falls in the middle with approximately 50% of students completing (Nettles & Millett, 2006), and humanities fields tend to have the lowest rates (CGS, 2007). It is important to note that these aggregate rates of completion and disciplinary differences by discipline/field have persisted across the last 30 years in national studies across multiple institutions (Bair & Haworth, 1999/2004; Bowen & Rudenstine, 1992; CGS, 2007/2008; Most, 2008; Nettles & Millet, 2006; Nevill & Chen, 2007). In order to understand the reasons behind variations in degree progress and completion in Engineering and Education, it is important to place degree completion within the greater context of doctoral education within each field.

Doctoral Education in Education and Engineering

The culture of doctoral education is a reflection of academic culture and the culture of the "disciplinary community" (Gardner & Mendoza, 2010, p. 81). The "academic discipline" refers to a "body of knowledge with a reasonable logical taxonomy, a specialized vocabulary, an accepted body of theory, systematic research strategy, and techniques for

replication and validations" (Donald, 2002, p. 8). Examples of academic disciplines include anthropology, biology, chemistry, history, psychology, and sociology. However, a "field" is different from a discipline in that it crosses disciplinary boundaries and often focuses on practice (Golde & Walker, 2006). Education and Engineering are considered fields but function exactly like a disciplinary community with their own distinct cultures that shape the nature of doctoral education and the doctoral student experience. Education and Engineering are similar fields of study in that they are two of the most highly gender-stratified fields in terms of doctoral enrollment and degree recipients and focus on applying theory to practice. Education and Engineering doctoral programs are housed in professional schools at doctoral-granting research universities, and the majority of their graduates aspire to practice the profession after receiving the doctoral degree (Golde & Walker, 2006; Goldman & Massy, 2001; Nettles & Millett, 2006). A discussion of the cultures of doctoral education in both Engineering and Education is warranted to provide a better understanding of typical doctoral student experiences and degree completion.

Education Field

Education is a multi-disciplinary field of study and also an enterprise of systems for the practice of educating students (Golde & Walker, 2006). There is debate within the literature as to whether Education can be considered an academic discipline or field of study. Most experts consider Education a field rather than a discipline because it brings together traditional disciplines to inform the creation and delivery of education and its systems (Golde & Walker, 2006). Education is organized into sub-specialties such as educational policy, educational psychology, curriculum and instruction, literacy education,

mathematics education, science education, teacher education, higher education and special education (Walker, Golde, Jones, Conklin Bueschel, & Hutchings, 2008).

Like Engineering, Education is a high producing field of doctoral degrees. Approximately 13% of all doctorates awarded in 2012 were in Education at approximately 200 doctoral-granting universities in the United States (Gonzales, Allum & Sowell, 2013). Typically, Education doctoral programs are housed in professional schools of Education and require two to three years of coursework, qualifying or comprehensive examination, a dissertation, and often numerous hours of practical or clinical experience in teaching or the practice of the profession (Perry & Imig, 2008). The Education doctoral program curriculum is reflective of the specialized knowledge in each sub-specialty of Education (educational administration, educational psychology, secondary education, special education, educational leadership, etc.). Overall, Education is considered a feminized profession –currently 67% of doctoral degrees are awarded to women, although women became the majority of degree recipients in Education in 1987 (Gonzales, Allum & Sowell, 2013; Golde & Walker, 2006; NSF, 2014). In addition, 71% of doctoral recipients are white, and 91% are U.S. citizens (NSF, 2014). Prior to beginning doctoral study, only a third of Education doctoral students have a bachelor's degree in Education, and so incoming doctoral students have diverse educational backgrounds and do not share the same core body of knowledge at entry as they do in Engineering. The majority of Education doctoral candidates have worked in the field as teachers or administrators which make Education students on average older than the typical Engineering student. Most Education doctoral students use their personal resources to finance the cost of their education, receive some tuition remission from the K-12 schools and higher education institutions where they work full-time, and pursue the doctoral degree

part-time which is why Education doctoral students take an average of 8 to 12 years to finish their degrees (Golde & Walker, 2006; NSF, 2014).

Education doctoral students are stewards of Education both as a field of study and a system of practice, including its creation and delivery (Golde & Walker, 2006). Given that only 38% of Education doctoral students plan to pursue careers in academia as faculty or post-doctorate research fellows, the emphasis for many research-oriented Ph.D. and more practitioner-oriented Ed.D. programs is to prepare scholar-practitioners (Perry & Imig, 2008; Walker et al., 2008). That is, Education doctorates are responsible for understanding the historical and contemporary bodies of knowledge in the field as well as the effective applications of that knowledge to both the classroom and policy arenas. Like Engineering, two-thirds of Education doctorates choose careers as educators, researchers, or administrators rather than as tenure-track faculty (Nettles & Millett, 2006).

Engineering Field

Engineering is a field that produced approximately 8,000 doctoral degrees in 2011-2012 representing 14% of the total number of degrees awarded that year (Gonzales, Allum & Sowell, 2013; NSF, 2014). Overall, Engineering is a masculinized profession – the typical doctoral student in Engineering is a male, white, and foreign-born. Of the more than 50,000 Ph.D. students enrolled in 198 doctoral degree programs in Engineering in Fall 2011, approximately 77% were men, 70% were white, and 55% were non-US residents, and this gender, race/ethnicity, and citizenship representation remain the same for Engineering doctoral degree recipients (Gonzales, Allum & Sowell, 2013; NSF, 2014). Engineering doctoral students complete two years of coursework, complete qualifying examinations, and work on the dissertation while simultaneously conducting

research with their faculty advisor in research labs (Committee on Science, Engineering, and Public Policy [COSEPUP], 1995/2007; Goldman & Massy, 2001). The majority of doctoral students enrolled in doctoral programs in Engineering received their undergraduate degree in Engineering, and thus students begin doctoral study with a common body of knowledge about Engineering principles (National Academy of Sciences, 1985). However, Engineering doctoral programs are specialized and organized into departments by Engineering specialization. Typically, Engineering offers the Ph.D. as the terminal degree in the sub-specialties of Aeronautics and Astronautics, Biological, Chemical, Civil, Environmental, Electrical, Computer Science, and Mechanical Engineering (COSEPUP, 1995; National Academy of Sciences, 1985).

Engineering doctoral students also are overwhelmingly enrolled in their degree programs as full-time students. In 2012, 70% of all Engineering graduate students were enrolled full-time (Gonzales, Allum & Sowell, 2013). Throughout the five years on average it takes to complete an Engineering Ph.D., most doctoral students receive full funding from their institutions to cover the cost of tuition and living expenses. The Engineering department funding depends largely on grants received from federal research and development organizations such as the National Science Foundation (NSF) and the National Institute of Health (NIH) to fiscally support Engineering doctoral education which is unique to SEM fields (Goldman & Massey, 2001; National Academy of Sciences, 1985). In exchange, the majority of doctoral students work as research assistants (63%) or teaching assistants (45%), and some students work as both (COSEPUP, 1995; Nettles & Millett, 2006). The dissertation in Engineering typically consists of a series of journal articles based upon the student's original research often

conducted in conjunction with faculty advisor in the lab. Doctoral students in Engineering are able to complete their dissertations, and thus their Ph.Ds. quickly because they begin working on the research which serves as the basis of their dissertation during the first year of doctoral study (COSEPUP, 1995; Goldman & Massy, 2001). Engineering is a professional discipline, and despite the primary purpose of research doctorates as preparation for academic careers, the career trajectory of most Engineering doctorates involves careers in research or industry. In fact, in a large survey of over 9,000 doctoral students, only 28% of Engineering doctoral students plan to become faculty or post-doctoral research fellows upon completing the Ph.D. (Nettles & Millet, 2006). Although the culture of Education is different in terms of the typical student demographic profile, both Education and Engineering doctoral recipients utilize their degrees to pursue careers in the practical profession.

General Factors Affecting Doctoral Degree Progress and Completion

Studies from the 1970s, ’80s, and ’90s suggest that indicators of academic ability of doctoral students at entry are not reliable predictors of doctoral degree completion. Among the indicators examined are undergraduate and master’s degree grade point average (GPA), standardized test scores on the Graduate Record Examination (GRE) or the Miller Analogy Test (MAT), and academic major. Doctoral degree completers and non-completers did not differ significantly on most of these academic indicators when beginning doctoral study (Bair & Haworth, 1999/2004; CGS, 2007; Maher, Ford, & Thompson, 2004; Malone, Nelson, & Nelson, 2004). These findings clearly suggest that academic ability cannot explain or predict variations in doctoral degree completion; that is, most doctoral students who enter doctoral programs have the academic ability to complete the degree. However,

studies focusing on doctoral student population emphasize both individual and institutional factors to explain why students continue to progress through or withdraw from their doctoral programs (Abedi & Benkin, 1987; Bair & Haworth, 1999/2004, Golde, 2000/2005; Lovitts, 2001; Malone, Nelson, & Nelson, 2004; Williamson, Tracy, Molasso, Meirovitz, & Downing, 2004).

Individual Factors

Individual factors affecting doctoral degree completion primarily refer to psychosocial factors and personal circumstances. Bair and Haworth (1999/2004) specified three psychological variables based on their meta-synthesis of 118 studies conducted between 1970 and 1998 that were significantly related to doctoral degree completion or attrition: student motivation, goal commitment, and well-being. Gender will also be considered as an individual factor, since the research is mixed as to whether gender mediates the likelihood of doctoral degree completion.

An individual student's motivation is inextricably linked to the likelihood for completing the doctoral degree. Both students and faculty have indicated that student motivation, or lack thereof, is an important factor connected to doctoral degree completion or non-completion (Bair & Haworth, 1999/2004; Barelson, 1960; CGS, 2009). Some of the studies linked motivation with commitment in which students indicated that they felt intensely committed to completing their degrees and were unwilling to experience failure which acted as the source of motivation for persisting (Bair & Haworth, 1999/2004).

Related to motivation, individual reasons for and a personal commitment to finishing the doctoral degree, especially if completion has implications for one's career,

is a contributing factor to timely doctoral degree completion. Students who perceived that the doctoral degree would positively influence their career path, often in terms of promotion or higher salaries, were more likely to persist and earn the degree (Bair & Haworth, 1999/2004). Also, one study of early-finishers and late-finishers of doctoral degrees at one institution concluded that 100% of the early-finishers said setting the goal of timely degree completion was a critical factor for degree completion (Maher, Ford, & Thompson, 2004). Also, the ability to set goals and follow through is related to two other personal factors – perfectionism and procrastination. Students who completed all requirements except the dissertation (all but dissertation, or ABD status) reported higher levels of procrastination and perfectionism behaviors than students who completed the dissertation (Green, 1997). Both procrastination and perfectionism are expressions of an individual's locus of control over completing tasks and are most often used as coping mechanisms for poor self-esteem and well-being.

In some studies, poor emotional and physical health are the reasons why students withdraw from doctoral degree programs (Lovitts, 1996/2001). The ability to complete the doctoral degree is at times related to the student's ability to manage pressure and the students' emotional well-being (Sigafus, 1998). Emotional support is particularly important for healthy well-being and in turn doctoral degree completion. Emotional support from family and significant others was mentioned as the third most common factor by 57% of over 1,400 doctoral degree completers in a recent national sample (CGS, 2009). Doctoral students value the emotional support they receive from family and significant others which serves as an emotional and physical motivator for students to continue to persist and complete the doctoral degree.

However, even though spousal and family support can facilitate doctoral degree persistence, a change in marital and family status during graduate school is an inhibiting factor. A national study of over 9,000 students indicated that the most frequently cited reason for leaving graduate school among non-completers was because of a change in family status, such as marriage or divorce, and the birth of children (Nevill & Chen, 2007). Thus, a doctoral student's immediate personal circumstances, in particular family and work, also play a role in degree completion.

Research on whether gender is an individual factor that affects doctoral degree completion appears to be mixed. One study by Abedi and Benkin (1987) of over 4,000 doctoral students who received their PhDs at one public research institution in a 10-year timeframe found sex as a significant predictor of time-to-degree: women took 1.2 years longer to complete the degree than men, but yet this difference was largely attributed to field of study. Men were overly concentrated in the Engineering and physical science fields where the average time to completion was the shortest (6.8 years) whereas women were concentrated in humanities and Education which averaged the longest time to completion (11 years). However, Nettles and Millett (2006) in their national sample of over 9,000 U.S. doctoral students completing Ph.Ds. across 21 institutions and 11 fields of study between 1997 to 2001 found no significant gender differences between men and women within similar disciplines with the exception of Education where women were more likely to finish PhDs (54% of women vs. 49% of men). More recent national findings by CGS documents that women are less likely to complete the doctoral degree than men across all disciplines (55% of women vs. 58% of men), and within SEM disciplines (CGS, 2008). Women face several individual barriers in pursuing their doctoral degrees including low self-confidence,

self-doubt, and a tendency to underestimate their competence and academic ability. These barriers will be described in greater detail in the section focusing on women's doctoral degree progress.

Individual factors predicting the likelihood of doctoral degree persistence and completion are often beyond the control of institutions of higher education, and yet doctoral-granting institutions do have control over the climate of their disciplines, departments, and doctoral programs which each are important for shaping the experiences of doctoral students, and in turn doctoral degree persistence and completion. Because significant institutional resources (funding, faculty time, energy, and salaries) are invested in doctoral education, understanding the institutional factors contributing to students' degree progress is critical (Lovitts, 2001).

Institutional Factors

The most prominent factors for doctoral degree completion, based on a meta-synthesis of 118 research studies by Bair & Haworth (1999, 2004), are related to either the academic discipline/field of study, institutional department, or the doctoral program. CGS (2009) constructed an exit survey asking thousands of doctoral degree completers and non-completers to identify as many factors from the following list that they perceived facilitated or inhibited their doctoral degree completion. With the exception of family support and personal circumstances, the majority of the factors identified by CGS are specific to the academic discipline/field of study and the institutional department in which the doctoral program is situated (CGS, 2004/2009). The findings from 1,400 completers who responded to the CGS survey revealed that financial support (80%) and the quality of the mentoring/advising relationship with faculty (65%) were the two most frequently cited

reasons for completing the doctoral degree by doctoral degree completers across all disciplines (CGS, 2009). Other institutional factors commonly cited in the research include social environment/peer group support, program requirements and career guidance, which are all a function of disciplinary and department/program culture. Thus, three types of institutional factors will be discussed in terms of their influence on doctoral degree persistence and completion: financial factors, student-faculty advising relationships, and discipline and department culture.

The most prominent factor cited in the doctoral degree completion research over the last three decades is institutional financial support (Abedi & Benkin, 1987; Bowen & Rudenstine, 1992; CGS, 2009; Lovitts, 2001; Nettles & Millett, 2006). Financial support typically refers to the ways in which doctoral students pay for their doctoral education. Institutional financial support is the most common way that doctoral students pay for their doctoral education –approximately 67% of all doctoral students receive institutional financial support, either through a fellowship or an assistantship granted by the university or department to the student (Nettles & Millett, 2006). Fellowships are scholarships typically based on academic merit and require no obligations on the part of the student besides remaining in good academic standing with the institution. Assistantships are similar to employment in which doctoral students work for the department performing research or teaching activities, or a combination of both in exchange for a tuition and/or monetary stipend (Lovitts, 2001).

Overall, low levels of financial support are associated with a decreased likelihood of doctoral student persistence. Low and erratic levels of funding cause a great deal of stress for doctoral students and contribute to their decisions to leave their doctoral programs or

longer timeframes for degree completion (Maher, Ford, & Thompson, 2004; Moyer, Salovey, & Casey-Cannon, 1999; Nettles & Millet, 2006). Doctoral students employed as research assistants (RAs) or teaching assistants (TAs) are more likely to persist and earn their doctoral degrees in less time than students without assistantships (Abedi & Benkin, 1987; Bowen & Rudenstine, 1992; Girves & Wemmerus, 1988; Maher, Ford, & Thompson, 2004). However, among the two types, students employed as RAs take less time to complete their degrees than TA students (Sallee, 2008; Seagram, Gould, & Pyke, 1998). The researchers claim that RA students are spending time conducting research that may be related to their dissertation as a requirement of their assistantship, whereas TA students are spending time teaching which is counterproductive to advancing their dissertation research.

In addition, the level and type of institutional support doctoral students receive varies by discipline. Typically, students receive an assistantship in which they receive funding from the doctoral department and in return work within the department at the institution performing research, teaching, and/or service activities under the guidance of a professor. Whereas in Engineering, 71% of doctoral students receive an assistantship of any form, the percentage is much lower in Education - only 46% of Education doctoral students receive an assistantship (Nettles & Millett, 2006). This is partly due to differences in enrollment patterns since the majority of Engineering doctoral students enroll full-time and thus assistantships are part of the funding package, whereas in Education most students are enrolled part-time while simultaneously working full-time as educators or administrators (Gonzales, Allum & Sowell, 2013; Golde & Walker, 2006). The lack of funding and tendencies toward part-time enrollment common in Education doctoral programs explain Education's longer time-to-degree. Not only does the level of funding vary in Engineering

and Education, but also the type of assistantship students receive differs greatly. Engineering doctoral students (69%) primarily receive research assistantships to fund their education compared with only 26% of Education students. Doctoral students in social science and humanities (SSH) fields and Education are more likely to receive teaching assistantships when they do receive institutional support if enrolled as full-time doctoral students (Nettles & Millett, 2006). Considering that doctoral students funded as RAs are more likely to complete their degrees and in less time than students funded as TAs, disciplinary differences in the type of institutional financial support awarded has serious implications for disciplinary differences in doctoral degree completion.

The degree and quality of the relationship between the student and his or her advisor/faculty is also positively correlated with doctoral degree completion, and this was the single most pervasive finding consistent across both quantitative and qualitative studies (Austin, 2002; Bair & Haworth, 1999/2004; CGS, 2009; Ferrer de Valero, 2001; Golde & Dore, 2001). Of the 1400 completers responding to the CGS exit survey, 65% indicated that their relationship with their faculty advisor (most likely the dissertation chair) was a critical contributing factor to their completion of the doctoral degree (CGS, 2009). According to Tenenbaum, Crosby, and Gliner, (2001), quality advising typically involves providing three types of help: instrumental help (teaching technical skills related to doctoral study), psychosocial help (emotional support), and networking help (professional contacts within the field). Quality faculty-student relationships are those in which faculty provide all three types of help and are accessible, interact frequently with and provide feedback to the student, and these types of relationships are associated with higher levels of academic performance and student satisfaction (CGS, 2009; Girves & Wemmerus, 1988; Golde,

1996/2000; Paglis, Green, & Bauer, 2006; Tenenbaum, Crosby, & Gliner, 2001). Doctoral students persist and earn doctoral degrees because of quality advising, but they also leave their doctoral programs because of poor advising where the advisor is unavailable, disinterested, or there is conflict (CGS, 2009; Golde, 1996/2000; Nerad & Miller, 1996). In addition, the context of student-faculty advisor interactions plays an important role. Interactions in both academic and social environments (e.g. departmental social functions) contribute to students' satisfaction with the quality of the advising relationship (Schroeder & Mynatt, 1999).

The third institutional factor that influences doctoral degree completion is the culture of the discipline or field and the department. The research overwhelmingly points to the role of both the discipline and department in understanding variations in doctoral student experiences and degree completion (Bair & Haworth, 1999; Girves & Wemmerus, 1988; Golde, 2000, Golde, 2005, Lovitts, 2001). In their meta-synthesis of 118 doctoral degree attrition and persistence studies between 1970 and 1998, Bair and Haworth (1999/2004) concluded that 1) doctoral degree completion and attrition rates varied by discipline and program of study, and 2) department culture affects persistence. Thus, the literature on both disciplinary and department culture will be considered separately to explain their effects on the doctoral student experience and degree completion.

An academic discipline refers to a "body of knowledge with a reasonable logical taxonomy, a specialized vocabulary, an accepted body of theory, systematic research strategy, and techniques for replication and validations" (Donald, 2002, p. 8). Each discipline has its own set of beliefs, values, norms, and practices that define the social structure of the discipline which shape the behaviors and actions of individual members

within the "disciplinary community" (Gardner & Mendoza, 2010, p. 81). Disciplinary culture varies across broad fields of study as well as across institutions and is the factor that most significantly predicts doctoral degree completion after academic and demographic factors are accounted for (Bair & Haworth, 1999/2004; Bowen & Rudenstine, 1992). Explanations for differing rates of degree completion between SEM and SSH fields point to the highly structured nature of SEM and the ambiguity of SSH culture in terms of financial support, student-faculty advising relationship and program requirements (Bair & Haworth, 1999/2004; CGS, 2009; Golde, 1996/2000). In addition, field differences exist in the organization of the research community; some research suggests that the collaborative and social atmosphere of the research lab and research team characteristic of SEM fields provide a more supportive environment for degree completion than the dyadic and solitary relationship between a doctoral student and his or her research advisor common in the SSH fields (CGS, 2004; Ferrer de Valero, 2001). Disciplinary culture is more accurately reflected in the department culture, which also plays a role in shaping doctoral students' experiences and the likelihood for persistence (Bair & Haworth, 1999/2004; Golde, 2000/2005).

Departmental culture is often guided by and a reflection of the norms of the discipline in which the departmental faculty situate themselves (Hirt & Muffo, 1998). Various aspects of department culture are important to doctoral degree completion. Golde's (2005) study emphasized academic integration, faculty support, program structure, and quality of the advising relationship as important factors for doctoral degree completion, and these characteristics can vary by institutional department (Bair & Haworth, 1999; Lovitts, 2001; Sigafus, 1998). Based on her interviews of 58 students who left their doctoral programs, Golde (2005) concluded that students were more at risk for leaving their doctoral

programs when there was a "mismatch" between the student (his or her values, professional goals, research interests) and that of the academic discipline and department. This mismatch is particularly important considering that the students' primary mode of socialization into the disciplinary community is through the academic department and its culture as the primary locus of control for doctoral education (Barelson, 1960; Bowen & Rudenstine, 1992; Nerad & Miller, 1996) Department culture is influenced by the culture of the faculty and administration within the department. According to Girves and Wemmerus (1988):

> The department characteristics directly influence doctoral degree progress. The norms and expectations of the faculty vary by department. The nature of the department, including the attitudes of the faculty and the activities that they value and engage in determine, in part, the kind of experience that a graduate student has (p. 186).

Doctoral students also have an influence on departmental culture and their doctoral experience in that they bring with them unique beliefs, values, perspectives, and experiences that shape the ways in which they engage with their discipline, department, and doctoral program. Student involvement in academic or research activities of the department and the profession is particularly important for degree persistence and completion (Ferrer de Valero, 2001; Girves & Wemmerus, 1988; Golde, 2000/2005). Doctoral students who make efforts to integrate into both the academic and social systems of the institution, with academic integration being most important for graduate students, are more likely to persist (Tinto, 1993). Similarly, peer support was also a factor cited by 40% of doctoral degree completers in a recent exit survey as a contributing factor to their ability to complete the degree (CGS,

2009). In sum, doctoral student peer culture can shape and be shaped by disciplinary and department culture.

Even though both individual and institutional factors influence the likelihood for doctoral degree completion, the bulk of the evidence suggests that variations in doctoral degree completion are more a function of the "gender of the discipline/field and department rather than the gender of the individual student (Gardner & Mendoza, 2010). Women tend to experience disciplinary and departmental culture differently than men, which may explain gender imbalances in doctoral degree progress and completion in both Education and Engineering.

Women's Doctoral Degree Progress and Completion

Beyond the general factors affecting doctoral degree completion previously discussed, women are overall less likely to complete the doctoral degree after beginning doctoral study. CGS' *Ph.D. Completion Project* concluded that whereas 58% of men completed the doctoral degree within 10 years, only 55% of women completed within the same timeframe (CGS, 2008). Other studies corroborate this finding that gender differences exist in doctoral degree completion rates across all disciplines with women lagging behind men (Abedi & Benkin, 1987; Lovitts, 2001; Most, 2008). The gender disparities are greatest in Engineering, where 65% of men complete compared to only 56% of women (CGS, 2008), and less pronounced in Education, where 54% of women complete vs. 49% of men (Nettles & Millett, 2006). Women are less likely to complete their doctoral degrees because they face additional individual, institutional, and socio-cultural barriers that men do not often experience (Ferreira 2002/2003/2010; Glazer-Raymo, 1999; Hall & Sandler, 1982; Litzler, Edwards Lange, & Brainard, 2005;

Martinez Aleman & Renn, 2002; Nettles & Millett, 2006; Ulku-Steiner, Kurtz-Costes, & Kinlaw, 2000). The majority of the research about women's barriers in higher education has focused on women in male-dominated SEM fields rather than Education. However, that does not mean that women in female-dominated fields like Education do not experience similar barriers. Thus, individual, institutional, and socio-cultural barriers will be discussed in terms of how they influence women's access to doctoral education and women's experiences of doctoral education in both SEM and Education.

Individual Barriers for Women

Researchers studied the patterns of enrollment in doctoral degree programs in the 1970s to determine what, if any, problem existed in gender discrimination of applicants (Thelin, 2004). What the researchers found was that while men and women were accepted at about the same rate overall, the difference was in the type of discipline they chose to pursue. Men tended to apply to SEM programs where funding was available and time-to-completion was quick. Women tended to apply to oversubscribed SSH departments like English and Education, and the "crucial implication was that undergraduate women were not applying to certain graduate fields," particularly SEM (Thelin, 2004, p. 345). Women's inequities in application to and enrollment in certain fields in the 1970s are reflected in current application and enrollment trends today.

It is unclear as to exactly the reason why SEM doctoral programs attract mainly men and SSH and Education doctoral programs attract mostly women, and yet research on individual factors such as self-confidence, and institutional factors such as the climate of the academic environment may provide some answers. Women at the graduate level report lower confidence in their academic abilities and decision-making than men, and

this finding was consistent in both SEM fields and Education. Women doctoral students experience higher levels of self-doubt and more negative perceptions of their competence in male-dominated doctoral programs such as SEM fields than women in gender-balanced programs (Ulku-Steiner, Kurtz-Costes, & Kinlaw, 2000). In addition, in both Engineering and Education, fields in which doctoral students reported the highest levels of confidence, women doctoral students reported that they were less confident than men in their decision to pursue a doctoral degree and their choice of doctoral program (Nettles & Millett, 2006).

It appears that trends in doctoral degree enrollment within SEM fields like Engineering and Education reinforce existing gender disparities in self-confidence. Because men are more confident about their perceived abilities, they are willing to follow their intellectual passion and pursue a doctoral degree in whichever field they choose, regardless of the "gender" of the doctoral field. On the other hand, women already enter doctoral programs with feelings of self-doubt and lower levels of academic self-confidence even in a prototypically female field like Education where they represent the majority of both students and faculty. Thus, institutional factors, related to the culture of the discipline, academic field, and department, play an equally important role in shaping the type of experience a woman doctoral student has (Bair & Haworth, 1999/2004; Gardner & Mendoza, 2010; Golde, 2005).

Institutional Barriers for Women

The doctoral experience is a function of the interaction between the individual doctoral student and the cultural beliefs, values, and assumptions of both the discipline and the department (Barelson, 1960; Bowen & Rudenstine, 1992; Golde, 2000/2005;

Golde & Dore, 2001; Nerad & Miller, 1996; Tinto, 1993). The research suggests that women experience critical aspects of their doctoral experience differently which in turn affect their degree progress (Gardner & Mendoza, 2010). Three institutional factors affecting degree progress previously discussed in this literature review—the type and level of financial support, the student-faculty advising relationship, and disciplinary and department culture –are experienced differently by women (Abedi & Benkin, 1987; Bair & Haworth, 1999/2004; CGS, 2009; Golde, 2005; Nerad & Miller, 1996).

Of the two types of assistantships most common in doctoral education, research and teaching, the majority of the prior research suggests that men and women are equally likely to secure both types, and differences in the type of assistantship was more a function of discipline as previously discussed (Gardner & Mendoza, 2010). Nevertheless, the most current national figures from the *Survey of Earned Doctorates* report of 2009 doctoral degree recipients depict slight gender differences in the type of financial report received by women and men doctoral students within the same discipline. Within SEM fields, slightly more men (29%) received research assistantships than women (23%), whereas more women received fellowships (36%) to fund their education than did men (34%; NSF, 2010). Gender differences in financial support, in particular fellowships, have to do with the demand for more women in science and engineering fields. Many of these fellowships are funded by the federal organizations such as NSF and NIH to encourage women and racial/ethnic minorities to pursue doctoral study in these fields (Nettles & Millett, 2006).

The relationship between a doctoral student and his or her advisor is integral to doctoral student success (Austin, 2002; Bair & Haworth, 1999/2004; Gardner &

Mendoza, 2010; Nettles & Millett, 2006). Overall, women were more likely than men to report poor advising relationships (Austin, 2002; Ferreira, 2002; Nerad & Miller, 1996; Nettles & Millett, 2006; Schroeder & Mynatt, 1999). With respect to social interaction, men in both Engineering and Education and doctoral programs reported more positive interactions with their advisors than did their female counterparts in one multi-institutional study of over 9,000 doctoral students (Nettles & Millett, 2006). In particular, women doctoral students' perceptions of their interactions with male faculty were very different from the perceptions of male doctoral students. Women perceived that the male faculty and advisors were more available and willing to provide personal and professional counseling to their male students. Also, women believed their male faculty advisors were more critical of their work and less interested in developing personal relationships. Also, doctoral women reported weaker interactions with male advisors than with female advisors than men did with advisors of either gender (Sallee, 2008; Schroeder & Mynatt, 1999). In general, same-gender advising relationships elicit the most positive outcomes for both men and women (Nettles & Millet, 2006).

Clearly, the gender of the faculty advisor influences the quality of doctoral student-faculty advising relationships, and having a same-sex faculty advisor is especially important for women (Nettles & Millett, 2006; Schroeder & Mynatt, 1999). Although women have made significant gains in representation as full-time and tenure-track faculty in the last 30 years, women continue to remain underrepresented in the academic profession at all ranks and levels. Thus, women doctoral students are at a disadvantage when seeking out female faculty as advisors and mentors who represent 41% of all full-time faculty but only 26% of full professors and 40% of associate professors. Women

fare slightly better in assistant professor tenure-track positions representing 47%, but are still overly represented in non-tenure track positions as instructors (54%) and lecturers (53%; The Almanac of Higher Education, 2010). Many of these non-tenure-track women are not eligible to serve as faculty advisors to students because of institutional and department policies. At best, these women faculty can serve as more informal mentors to women doctoral students.

In the Engineering field, the gender stratification among faculty is even more pronounced; women represent only 11% of full-time tenured or tenure-track faculty across all ranks (NSF, 2008). In Education, women doctoral students have plenty of female advisors to choose from as women represent 61% of Education faculty (National Center for Education Statistics [NCES], 2010).With fewer women in positions of power as tenured and tenure-track faculty to serve as advisors and mentors for women doctoral students in male-dominated fields like Engineering, women doctoral students will have fewer opportunities to reap the benefits of same-gender advising relationships, which are critical to women's doctoral degree completion (CGS, 2009; Nettles & Millett, 2006).

Graduate student women continue to experience what Hall and Sandler coined a "chilly" climate inside and outside of the academic department which ultimately compromises their learning (1982; Morris & Daniel, 2008). For example, men's intellectual work is more highly valued when it is believed to be completed by a man than by a woman, regardless of the evaluator's own gender (Hall & Sandler, 1982). Although Hall and Sandler's seminal work on the "chilly climate" was published 30 years ago, recent literature has corroborated their findings about inherent biases of both men and women in devaluing women's academic accomplishments at the graduate level

(COSEPUP, 2007). Women graduate students continue to experience a variety of institutional constraints related to academic culture in male-dominated SEM environments today (Ferreira, 2002/2003; COSEPUP, 2007; Moyer, Salovey, & Casey-Cannon, 1999; Ulku-Steiner, Kurtz-Costes, & Kinlaw, 2000).

The COSEPUP (2007) report is an exhaustive review of the most current research on women in science and engineering and found that various institutional practices related to the isolating climate in SEM contributed to women's obstacles throughout the academic pipeline, particularly doctoral candidates seeking to enter academic careers. Ferreira (2003) investigated the gendered issues related to graduate student attrition in two science departments (biology and chemistry) using a sample of 170 graduate students (71 women and 99 men) at a large research university. Reasons for women's attrition were related to both disciplinary and department contexts. In particular, factors such as the working environment in the research laboratory, and a lack of collegiality with faculty advisors and peers contributed to women's low levels of satisfaction (Ferreira, 2002/2003/2010). At the doctoral level, women doctoral degree students in SEM fields experience lower levels satisfaction with their programs, particularly with their interactions with advisors, and perceived the SEM academic environment as one emphasizing isolation and competition more often than men (Ferreira, 2002; Litzler, Edwards-Lange, & Brainard, 2005; Nettles & Millet, 2006).

Socio-cultural Barriers for Women

Historically, higher education and more specifically doctoral education has been a male-dominated arena because of society's assumptions about women's limited intellectual capacity to handle the academic rigor required of pursuing advanced degrees

(Martinez Aleman & Renn, 2002; Thelin, 2004). Thus, women have had to overcome both social and cultural stereotypes about women belonging in the academic realm. Current research suggests that women's choices of discipline are affected by societal perceptions about the "gender" of the discipline: SEM is perceived as a "masculine" discipline and therefore doing math or science is considered "unfeminine", whereas Education and the caring professions are considered "feminine" professions (AAUW, 2008; Hartman & Hartman, 2008).These socio-cultural influences on women's choice of doctoral discipline are often unconscious given that they are deeply rooted into societal and epistemological assumptions about the gender of knowledge and professional identities (Code, 1991; Glazer-Raymo, 1999; Martinez Aleman, 2008)

One way that women doctoral students are encouraged to pursue doctoral study, especially in more masculine SEM fields, is through interactions and support from female role models. However, there is a scarce pool of these female role models to encourage women undergraduate and graduate students to pursue careers in SEM (Hartman & Hartman, 2008), and more women doctoral students than men report that they do not have a mentor to guide them through doctoral study (Nettles & Millet, 2006). Female faculty are individuals who often serve as mentors for women doctoral students and are often severely underrepresented in academia (NSF, 2014). In addition, women are often pursuing doctoral study during their primary childbearing years, and because women more so than men take on the burden of childcare and family responsibilities, the conflict women experience between fulfilling motherhood and professional roles impedes their advancement as doctoral students and as early career faculty (COSEPUP, 2007; Nettles & Millett, 2006).

Title IX of the Educational Amendments of 1972 protects individuals from discrimination on the basis of sex in any educational program or activity that receives federal financial assistance (Title IX, 20 U.S.C. §§ 1681 et seq.), and yet sexual harassment and discrimination of women in higher education is a common occurrence. In college, approximately 70 to 90% of undergraduate women have been harassed by other male students (Martinez Aleman & Renn, 2002), and 20% of graduate women have experienced harassment often from male professors (Kelley & Parsons, 2000). Sexual harassment also manifests itself through the power inequities in the verbal exchanges inherent in the student-teacher relationship. Research indicates that overt sexist verbal comments that belittle women or devalue their intellectual ability, seriousness, and commitment to academic study are still prevalent among faculty, especially male faculty, in SEM fields (Hall & Sandler, 1982; COSEPUP, 2007). In particular, women graduate students in male-dominated SEM doctoral programs are particularly susceptible to experiencing gender discrimination in the form of male professors "hitting" on them in a sexual or romantic manner (Ferreira, 2002; Litzler, Edwards Lange, & Brainard, 2005).

Gaps in the Literature

Unlike SEM fields, studies focusing on women's experiences of obstacles in prototypically female fields like Education are sparse in the research. Little is known about whether women face similar or unique obstacles to doctoral degree completion in more feminized fields like Education in comparison to women in masculinized fields like Engineering. The few studies that have examined gender differences in specific aspects of the doctoral experience in Education have generally found that women report more negative academic and social interactions with faculty and are less satisfied with their

doctoral programs than their male peers (Nettles & Millett, 2006; Watford, 2007). A recent published dissertation using qualitative methods concluded that although women doctoral students in Psychology, Education, and Sociology believed that they had access to important socialization opportunities such as research, publication, and frequent interactions with faculty advisors, their experiences of these socialization experiences were qualitatively less positive. Specifically, women perceived that opportunities to participate in research projects, and receive career guidance and job search support as less available than their male doctoral student peers (Watford, 2007).

Overall, there is a dearth of literature addressing women's doctoral experiences and degree progress in female-dominated fields like Education because anecdotally students and faculty assume these doctoral students do not experience the same barriers as women in SEM fields. More research investigating women's experiences in female-dominated fields like Education is needed to find out whether women are in fact having positive doctoral experiences as the timely and high doctoral degree completion rates would suggest. Based on the evidence presented thus far, gender variations in doctoral degree completion appear to be related to the "gender" of the discipline, in terms of its underlying beliefs, values, norms, and assumptions rather than the gender of the individual student. These disciplinary values and norms are passed on from faculty to doctoral students within the institutional department as part of the doctoral student socialization process. Thus, a thorough understanding of socialization theory is needed first in order to understand the ways in which academic and doctoral education culture shape women's doctoral student experiences.

Graduate Student Socialization

Socialization theory is a common theoretical framework for understanding how and why some doctoral students complete their doctoral degrees and why others do not complete and leave their doctoral programs. First, socialization must be defined as it is understood with the context of academia and graduate students. Next, because doctoral education is structured according to an apprenticeship model where students work as apprentices with faculty, one must understand the culture of the academic profession and how it manifests into doctoral education culture. Finally, while effective for understanding the doctoral experience in general, socialization theory is limited as a framework for understanding women's doctoral student experiences and degree completion. Thus, a more gender-sensitive framework such as critical feminist theory is needed because it places gender at the center of analysis.

Socialization Theory

Socialization theory is a commonly used theoretical framework for understanding graduate student experiences, persistence, and degree completion. Defined by Bragg (1976), "the socialization process is the learning process through which the individual acquires the knowledge and skills, the values and attitudes, and the habits and modes of thought of the society to which he belongs" (p. 3). Socialization occurs in four stages, the first of which is anticipatory socialization (Tierney & Rhoades, 1994; Weidman, Twale, & Stein, 2001). Anticipatory socialization occurs when individuals who are non-members of a particular group learn the norms, values, and behaviors of the group in which they desire membership. Within higher education, anticipatory socialization occurs during graduate school. Graduate student socialization is essentially professional socialization because

graduate students learns the knowledge, skills, and values that are necessary for success in a particular professional career (Weidman, Twale, & Stein, 2001). Graduate students learn how to become members of "the community of an academic department within a particular discipline" (Golde, 1998, p. 56). The academic department, which is a reflection of the norms and values of the academic disciplines and/or fields represented in the department, is the primary context for graduate student socialization. Throughout doctoral training, students learn the norms, values, and behaviors of what it means to be a member of the academic community of faculty scholars both in their department, and in their discipline and/or field of study (Gardner & Mendoza, 2010).

Doctoral Education and the Apprenticeship Model

In essence, doctoral education is an institutionalized process for socialization whereby "newcomers learn to fit an expected role and pattern of behavior" (Austin & McDaniels, 2006, p. 400). Typically the expected roles and patterns of behavior are those necessary for participation in "the profession of the scholar" (Walker et al., 2008, p. 8). The profession of the scholar is typically associated with the roles and responsibilities of faculty (Austin, 2002; Gardner, 2008). Doctoral education is structured around the apprenticeship model whereby doctoral students serve as apprentices to their professors and learn how to assume the role of "disciplinary expert" within the intellectual community (Gardner & Mendoza, 2010, p. 85). In order for disciplinary and departmental culture to survive, doctoral students must be taught to see their discipline and department in similar ways as the faculty as disciplinary experts do. Thus, in order to understand doctoral education culture, it is important to understand the culture of these disciplinary faculty experts, which is situated within the academic profession.

The Culture of the Academic Profession

Culture, according to Geertz (1973) is the "fabric of meaning in terms of which human beings interpret their experience and guide their action (p. 145). In other words, culture represents the beliefs and values people use to interpret their experiences which in turn influence their actions and behaviors. These actions and behaviors make up the social structure of an organization or social system (Geertz, 1973). Academic culture refers to the beliefs and values of the academic profession which faculty interpret and carry out in their role as "stewards" of their particular discipline (Golde & Walker, 2006). As "stewards," of their disciplines, faculty are responsible for generating, disseminating and transforming knowledge. These activities are guided by the academic profession's underlying values of elitism, hierarchy and status, individualism and autonomy, and power, each of which are reflected in the culture and social structure of doctoral education (Clark, 1987).

The academic profession is elitist because the core activities of generating, disseminating, and transforming knowledge are reserved for the most intellectually capable individuals. Faculty as experts of their discipline serve as the gatekeepers for newcomers into the disciplinary community (Clark, 1987). Similarly, doctoral education is reserved for the most intellectually capable students, and acceptance into a doctoral program signals membership into a community of intellectual elites much like that of the faculty (Walker et al., 2008). The hierarchal structure of doctoral education is similar to the promotion and tenure system in academia for faculty. Just as faculty must demonstrate competency in research, teaching, and service to move up the academic ladder, doctoral

students must also demonstrate their competency at each of the three phases of the doctoral program: coursework, qualifying examination, and candidacy (Gardner, 2009a).

The academic professional values of individualism and autonomy originated from scholastic guilds in Europe in the thirteen and fourteenth centuries. These ideas were eventually brought over to the United States, which led to the establishment of the American Association for University Professors (AAUP) in 1915. Academic freedom was a belief protected by the AAUP that enables faculty to inquire and teach whatever they want without intrusion from the institution and local, state, or federal government (Brubacher & Rudy, 1997; Kerr, 2001). Academic freedom enables faculty to have autonomy in both choosing the means for how they carry out both research and teaching activities, and the ends, the products of those activities (Altbach, 2005). The nature of the research process reinforces individualism whereby faculty scholars are rewarded, typically in the form of promotion and the granting of tenure, for their individual contributions to their disciplines or fields. These same values are reflected in doctoral education in the structure of the doctoral thesis/dissertation. Doctoral students conduct independent research for the thesis/dissertation and have some autonomy, although not to the same extent as faculty do, to choose both their topics and methods of inquiry (Gardner, 2009a). Finally, power is exemplified as a value in promotion, granting of tenure, and peer-review of research as common faculty activities in academia. Tenured faculty, those faculty at the highest ranks within the academy, have the power to determine the parameters for what types of inquiry, research, and activities are considered valuable for membership and advancement within the profession (Clark, 1987). Even though in

comparison to faculty doctoral students do not possess much power, doctoral students exert more power than master's and undergraduate students in the academic pecking order.

Limitations of Socialization Theory

Doctoral education is the first phase of socialization into an intellectual disciplinary community (Gardner & Mendoza, 2010; Walker et al., 2008). Nevertheless, socialization theory as a framework is insufficient in both scope and depth for understanding the complexities and differential doctoral experiences and degree progress of women (Golde, 2005; Weidman & Stein, 2003). Research critiquing socialization theory points to three limitations. First, the socialization process replicates existing cultural norms to its newcomers, and thus leaves little room for changes in culture over time (Tierney & Rhoads, 1994). Second, the doctoral student socialization process fails to prepare students for the realities of the future work they will actually perform. Because doctoral students are socialized to learn specialized, and often esoteric knowledge and skills, doctoral students lack guidance in how to transfer these specialized skills to industries and professions outside of academia where more than half of all Engineering and Education doctorates are seeking jobs due to the few full-time tenure-track faculty positions available (Austin, 2002; Finkelstein & Schuster, 2006; Golde & Dore, 2001). Finally, theories of socialization ignore individual differences because they assume that the socialization process is the same for everyone. In fact, socialization theory suggests that individuals (doctoral students) will have a problem with socialization if they do not successfully adopt the beliefs/values of the organization they are socialized into (the academy; Tierney & Rhoads, 1994; Weidman, Twale, & Stein, 2001). Thus, if the socialization process can and is experienced differently across individuals, it will most

certainly differ across gender. The socialization process in and of itself is gendered based on how students' beliefs, values, and assumptions, which are inextricably linked to their gender, interact with the gendered culture of the academic organization.

Gendered Institutions

Colleges and universities are "gendered institutions" in the ways their policies, processes, power structures, and decision making are organized and function according to gender (Acker, 1992). Britton (2000) and Acker (1992) postulated that organizations, including educational institutions, can be "gendered" in three ways. First, institutions are gendered based on demographics in terms of whether the majority of individuals who work in the field are men or women. Engineering is considered a masculinized field because the majority of Engineers are men, whereas Education is considered a feminized field because the majority of educators are women. Second, an institution is gendered in that it is "symbolically and ideologically described and conceived in terms of a discourse that draws upon hegemonically-defined masculinities" (Britton, 2000, p. 420). That is, the successful institution is one that displays characteristics associated with masculinity as the dominant gender identity. For example, many institutions, including academia, are characterized as aggressive, goal-oriented, competitive, and efficient, characteristics commonly associated with masculinity (Acker, 1992). Third, an organization is gendered in that its organizational processes and structure create distinctions that privilege one sex/gender over another (e.g. men over women, masculinity over femininity). Doctoral education as it exists within a particular discipline and department can be considered a gendered institution according to all three definitions because doctoral education's culture (i.e. its underlying assumptions, beliefs, and values) and disciplinary and department social structures reflect those of the

academic profession, a profession that was developed by and for men (Thelin, 2004). Following this logic, since doctoral education models itself after the academic profession, which originated as a male-dominated enterprise and was developed based on men's experiences, one can argue that doctoral education as a gendered institution is designed to privilege men over women, and masculinity over femininity (Code, 1991; Glazer-Raymo, 1999; Martinez Aleman & Renn, 2002).

Doctoral education as a mechanism for socializing doctoral students into disciplinary communities is "gendered" in the sense that the doctoral student experience is shaped by both the gender of the student and the gender of the discipline in which the department and doctoral program is situated. Disciplines, as academic organizations, have distinct beliefs, values, and structures which reflect and reinforce gender distinctions and the historically patriarchal values of academia and the academic profession as a social institution. The socialization process of graduate students will vary depending upon the gender of the disciplinary and department culture. Because institutions are "gendered," critical feminist theory is more useful for examining the gendered nature of doctoral education and its differential influence on women's doctoral experiences and degree progress.

Critical Feminist Theory

Critical feminist theory stems from critical theories which examine and critique social phenomena related to the subjugation of particular groups in society. Critical theories are not only concerned with the oppression of particular groups of people but also emancipation of these groups: that is, critical theory seeks to "to liberate human beings from the circumstances that enslave them" (Horkheimer, 1982, p. 244). Critical feminist theory introduced into feminist thought the process of "consciousness-raising" as a way

to liberate women from these social circumstances, and the discourses and cultures constructed from them. Critical feminist theory recognizes that in patriarchal American society, men have significant control over women's sexual and reproductive lives as well as their identity, self-respect, and self-esteem and this is the most widespread form of oppression (Tong, 2009).

Critical feminist theory places gender as the central category of analysis for examining how the social world is organized. Feminist theory focuses on the historical subjugation of women in terms of their social roles and lived experiences and attempts to explain the ways in which social structures reflect and reinforce women's oppression (Ropers-Huilman & Winters, 2011). Feminists recognize that women have valuable contributions to make and that women's experiences can serve as a legitimate source of knowledge and knowing (Code, 1991). Various forms of feminism exist depending upon explanations as to the cause of women's oppression and approaches for women to achieve equity. In particular, critical feminism rejects liberal feminism's ideas about women acting like men in order to achieve gender equity in society. Rather, critical feminism emphasizes that the root of women's oppression lies within the beliefs and values of patriarchal society and the gender relations within it. In a patriarchal society, created by and for men, biological differences between males and females are used as the primary distinction for constructing what is considered "masculine" and "feminine" to ensure that men have dominant masculine roles and women display submissive feminine roles. Thus, patriarchal society reflects and reinforces men's power over women by relegating them to act in accordance with the biologically-assigned sex (Tong, 2009).

In order for women to be liberated and achieve gender equity, the gender roles and the patriarchal structure of society must be changed in such a way to reconstruct a society which incorporates traditionally "feminine" values and beliefs as equally legitimate ways of thinking and acting alongside masculine ways (Code, 1991). The academy, and by extension, doctoral education as an institution historically developed and dominated by men reflects and reinforces epistemological beliefs and values associated with a patriarchal society, where the male experience and heteronormative masculinity is used as the basis for judging societal norms. Consequently, doctoral student socialization processes into academic and disciplinary culture is inevitably socialization into patriarchal culture which emphasizes the superiority of values associated with men and masculinity (rationality, objectivity, hierarchy, independence and autonomy, and productivity) over values associated with women and femininity (body, emotion, community, dependence, connection, and reproductive activities), as the antithesis of masculinity (Martinez Aleman, 2008; Tong, 2009).

The academy as a patriarchal organization espouses masculine values and therefore transmits these values to doctoral students throughout the doctoral training process. Doctoral students whose individual identities and values are incongruent with these values are going to have different socialization experiences than students whose values more closely mimic those of the academy and discipline. This degree of "match" between students' values and goals and those of the discipline and department is a critical factor in students' decisions to complete or leave doctoral degree programs (Golde & Dore, 2001; Golde, 2005). Thus, examining the gendered culture of doctoral education as it exists within the discipline and the department is more appropriate for understanding

women's experiences and degree progress because it brings gender to the forefront as a lens for examining the ways in which gender is embedded in institutional culture and structural processes and its effect on women's experiences (Glazer-Raymo, Townsend, & Ropers-Huilman, 2000; Martinez Aleman & Renn, 2002).

Gender Schemas and How They Shape Doctoral Education

Understanding the gendered nature of doctoral education culture and structure as a reflection of the culture and structure of the academic profession as it exists within disciplines and departments requires an understanding of where this gendered culture comes from. Although Valian (1999) first used the term *gender schemas* as a way to understand and raise consciousness of the invisible barriers that women face in the professions and why they are underrepresented in the academy, as well as in leadership positions, the concept of gender schemas originated from Bem's (1981) gender schema theory. A schema is a cognitive structure, typically a set of hypotheses that people use to organize and interpret their experiences and the world around them. Schemas develop in childhood and are molded and reinforced throughout one's adult life. Gender schemas are schemas constructed by society that are primarily based on the distinction between males and females (Bem, 1981). Valian (1999) adapted Bem's (1981) concept of gender schemas to describe how they "affect our expectations of men and women, our evaluations of their work, and their performance as professionals" (Valian, 1999, p. 2). Most importantly, these gender schemas typically underestimate women's abilities and performance and overestimate men's.

In general, we as a society use schemas to better understand our world, because schemas help organize and interpret human experience, and one of the categories that

humans uses to organize their world is gender – masculinity and femininity are socially constructed and often in juxtaposition to one another – masculinity is defined as not feminine, and femininity is defined as not masculine. With each new experience, society engages in sex typing, whereby they classify certain behaviors as either consistent or inconsistent with these culturally created definitions of masculinity and femininity (Bem, 1981).

These culturally created gender schemas are in turn inculcated into the norms, values, and expectations of the culture of the academic profession, and by extension doctoral education. Because men hold the majority of positions of power in the academic profession, as well as in other professional environments and men tend to espouse traditionally "masculine" values, masculine gender schemas are prioritized and reinforced over feminine schemas. Consequently, these gender schemas create an academic environment that intentionally or unintentionally is more conducive to doctoral students who share those same values, often men, and less conducive to those students who do not, often women (Code, 1991; Martinez Aleman & Renn, 2002). These taken-for-granted gender schemas ultimately shape the doctoral education environment and may in turn explain why and how allegedly gender-neutral cultures and structures perpetuate existing gender inequalities in academic disciplines and fields of study (Martinez Aleman & Renn, 2002).

Methodological Critiques

National studies on doctoral degree completion have not attempted to identify *the reasons* underlying the gender disparities in doctoral degree persistence and completion rates. These comprehensive quantitative studies instead document overarching trends in

doctoral degree completion or attrition by gender and broad field using regression analysis to examine the relationship between various individual and institutional factors and how well they predict completion/attrition rates (Abedi & Benkin, 1987; Bowen & Rudenstine, 1992; CGS, 2007/2008; Lovitts, 2001; Nettles & Millet, 2006). These national studies have tracked cohorts of hundreds or thousands of doctoral students upon entry or one year after entry into doctoral study through completion or attrition from the doctoral degree programs across multiple institutions and disciplines/fields, and yet these studies do not attempt to understand or take responsibility for the ways in which the institutional factors influence doctoral degree completion. A more recent national CGS (2009) exit survey of over 1,400 doctoral degree completers at 24 institutions and five broad fields of study attempted to identify the primary reasons for completion but did not disaggregate the results by gender due to institutional review board requirements. In sum, these national studies are simply descriptive and fail to provide in-depth information about the nature of the doctoral experience and its effect on completion or attrition for different subsets of the general population.

On the other hand, qualitative studies examining the nature of the doctoral experience draw upon both interviews and focus groups of non-completers (Gardner, 2007/2008; Golde, 1996/2005) and currently enrolled students who are contemplating whether to persist or leave (Golde, 2000; Gardner, 2009b, Earl-Novell, 2006). However, these qualitative studies of doctoral degree completion and attrition have not used feminist theory as an analytical lens for understanding women's doctoral student experiences and degree progress. One cannot assume that the doctoral experience and factors contributing to degree completion or non-completion will be uniform for all doctoral students given what is

known about the disciplinary differences presented in this chapter. Gardner's (2008) study identified five distinct socio-demographically-based groups of students who did not "fit the mold" of traditional graduate study. These groups included students of color, older students, students with children, part-time students, and women. Gardner's (2008) findings suggest that the doctoral experience and degree progress is different or magnified for these groups. Thus, a closer examination of the experiences of women doctoral students in highly gender-stratified fields like Engineering and Education is important to illuminate the differences between and also the similarities across these two fields.

Summary

Despite women's progress in higher education and recent emergence as the "new majority" in doctoral education as enrolled students and degree recipients, women continue to face a multitude of barriers in terms of their access to, experience in, and completion of the doctoral degree. The literature presented suggests that the "gender" composition of the discipline and department was most important for understanding differences in doctoral students' experiences and ultimately their degree completion (Gardner & Mendoza, 2010), but yet there is no evidence to date that explicitly suggests that the gendered expectations and norms of the discipline and department in which the doctoral program is situated are some of the reasons why women are proportionally more successful in completing doctoral degrees in Education and less successful in Engineering than their male counterparts.

The majority of the research on doctoral women has focused on women in male-dominated disciplines like SEM rather than women in female-dominated disciplines like Education. Socialization theory is the contemporary framework used in the literature for

understanding doctoral student experiences and disparities in doctoral degree completion in the United States. However, socialization theory alone is insufficient for understanding the gendered aspects of socialization, in particular women doctoral students' socialization into academic, disciplinary, and doctoral education cultures, because socialization theory assumes that the socialization process is the same for everyone. Critical feminist theory is a more appropriate lens for examining and critiquing the quality of women's doctoral experiences, and how the gendered nature of disciplinary and department culture affects women's degree persistence since it views gender (and other important aspects of one's identity such as race and citizenship) as a central organizing construct for interpreting the doctoral experience Critical feminist theory is an especially useful lens for understanding women's experiences and doctoral degree completion in highly gender-stratified fields like Engineering and Education because it can suggest that the intensely gendered culture of those two fields can and does affect men and women doctoral students differently, which in turn might explain women's differential doctoral degree completion (CGS, 2008; Most, 2008; Nettles & Millet, 2006).

Unanswered Questions

Critical feminist theory would suggest that the culture of doctoral education in Engineering is "masculine" and Education is "feminine" with norms, beliefs, and values based on the historical and philosophical assumptions about the gender of the professional who works in each in each of these disciplinary communities; i.e. Engineering is considered to be a realm for men and masculinity, whereas Education is a realm for women and femininity. Research over the last thirty years on women's doctoral degree attainment has focused on increasing women's representation in masculine SEM

fields throughout the academic pipeline as the panacea for gender equity. Much of this research assumes that women do not/cannot change disciplinary and department culture in SEM fields. However simply adding more women in SEM without examining the nature of SEM culture and the quality of women's doctoral experiences will not achieve this. It is unclear as to whether and how the gendered culture of Engineering and Education affects women's doctoral experiences, and in turn contributes to women's differential success in doctoral degree completion in these two fields.

Also, because women are overrepresented in the Education field, both as educators and doctoral students, the assumption is that Education's more "feminine" culture may explain women's success as recipients of two-thirds of all Education doctoral degrees (Gonzales, Allum, & Sowell, 2013). However, less is known about the gendered nature of doctoral education culture in Education, the quality of women's experiences in Education doctoral degree programs, their obstacles to doctoral degree completion, and whether women in Education experience similar or distinct obstacles as women in "masculine" fields like Engineering. The common assumption is that women in Education are progressing through their doctoral programs with few issues because they are surrounded by other women peers and faculty, and that the mere presence of more women automatically makes doctoral education in Education a more conducive academic environment for women's success. It is unclear as to whether women doctoral students studying prototypically feminine fields like Education are having overwhelmingly more positive experiences in their doctoral programs than women in prototypically masculine fields like Engineering. A comparative examination of women's doctoral experiences in

Education and Engineering is needed in order to empirically support, or perhaps refute this common assumption.

CHAPTER THREE: METHODS

Women doctoral students in female-dominated fields such as Education are an understudied population in comparison to women doctoral students in male-dominated fields like Engineering. While women's doctoral student experiences and degree progress in Engineering has been studied, less is known about whether there are similarities and differences in women's experiences and degree progress between the two fields, Engineering and Education, where women are the minority and the majority of doctoral degree enrollees and earners, respectively. Thus, I conducted a qualitative study using an interpretive phenomenological approach to capture and interpret the essence of women doctoral students' lived experiences in Education and Engineering. Specifically, this study compared and contrasted the lived experiences of women doctoral students pursuing degrees in Education and Engineering using a critical feminist perspective. This study aimed to find out how the gendered culture of doctoral education and women's doctoral experiences in Education and Engineering are contributing to women's doctoral degree progress. The following three research questions guided the study:

1. What is the gendered environment of doctoral education like for women enrolled in doctoral programs in Education, a prototypically "female" field, and Engineering, a prototypically "male field"?
2. How do the experiences of women enrolled in doctoral programs in Education and Engineering influence their doctoral degree progress?
3. How does the support for and barriers to women's doctoral degree progress in Education compare to the supports and barriers to women's degree progress in Engineering?

I conducted multiple interviews of women doctoral students in Engineering and Education and conduct two focus groups to answer these research questions. My data collection and analysis procedures were consistent with the assumptions of critical feminist research. Critical feminist research assumes that gender is a necessary lens through which women's experiences can be understood, and therefore seeks methodologies and knowledge that create social change to benefit women. In order to deeply understand the lived experiences of women doctoral students in Education and Engineering and address the above research questions, this study's design must include a discussion of the methodology, the researcher's perspective, the sample selected and data sources used, the data collection and analysis methods, and finally the research study's credibility and limitations.

Methodology

Qualitative Research

Qualitative research is especially helpful for answering the "what" and "how" questions about social phenomena by examining individuals' lived experiences (Marshall & Rossman, 2006). My research study compares and contrasts "what" women's doctoral experiences and doctoral degree progress looks like in Education and Engineering. Also, I am trying to understand "how" the gendered culture of doctoral education in Education and Engineering influences women's doctoral experiences and in turn their intentions to progress through their doctoral degree programs. Qualitative research can answer these questions because it focuses on the specific contexts in which doctoral culture, the doctoral student experience, and doctoral degree progress occurs (Harper & Museus, 2007; Patton, 2002). Thus, this qualitative research focused on women doctoral students

at two specific institutions and does not attempt to generalize across all institutions with doctoral degree programs in Education and Engineering.

In addition, qualitative research is fundamentally interpretive (Rossman & Rallis, 2003). Qualitative researchers acknowledge and understand the inter-relatedness between the researcher and the researched; that is, the research methods used are not separate from the researcher. The researcher is the instrument through whom the research is conducted. The data sources cannot speak for themselves--they must be interpreted by the individual researcher, and thus qualitative research assumes that the knowledge constructed throughout the research process is shaped by the contexts that the researcher chooses to study and by their personal biographies (Denzin & Lincoln, 2005; Rossman & Rallis, 2003). My perspective as a qualitative researcher and as a woman Ph.D. candidate studying Education, in particular how my perspective affects my choices for the design of this research study, will be discussed later in this methods chapter.

Phenomenology

In order to gain a deeper understanding of the phenomenon of the doctoral experience and degree progress for women in Education and Engineering, I conducted a phenomenological study because this research paradigm allows for capturing the "essence" of the meaning that individuals make of their lived experience of a particular phenomenon from the perspectives of those who experience the phenomenon "from the inside." (van Manen, 1997, p. 8). In this dissertation, I was able to gain a deep understanding about what the doctoral experience is like by talking to women doctoral students who actually lived the doctoral experience in their respective doctoral programs, departments, institutions, and academic fields. Phenomenology involves the "the study of

lived experiences and the ways we understand those experiences to develop a worldview" (Marshall & Rossman, 2006, p. 104). Thus, not only does a phenomenological approach illustrate "what" these women experienced throughout the course of doctoral study but also "how" they make meaning of those lived experiences within the context of their lives. This meaning making enabled a more complex view of the "essence" of these women doctoral students' lived experiences and realities in Education and Engineering and how they compare to one another (van Manen, 1997).

Because phenomenology as a method of inquiry is so closely tied to philosophy, a discussion of the philosophical assumptions that guide this research is warranted (Creswell, 2007). Moustakas (1994), who is most frequently cited for the procedures involved in phenomenology, differentiates interpretive phenomenology from descriptive phenomenology. This research study is aligned with the assumptions of the interpretive, or hermeneutic, phenomenology and the Heidegger tradition (Lopez & Willis, 2004; Moustakas, 1994; Smith, Flowers & Larkin, 2009). Heidegger used the term "life world", which is the idea that individual lived experience, and the meaning individuals make from their lived experiences, is dependent upon the context in which the experience occurs. Thus, instead of merely describing the essence of human experience, an interpretive approach attempts to uncover and interpret the relationship between an individual's personal context, and his or her lived experiences (Lopez & Willis, 2004; Moustakas, 1994; Smith, Flowers, & Larkin, 2009). In my study, I attempted to uncover the underlying meaning of the lived experiences of women doctoral students and their degree progress in relation to the gendered context of doctoral education culture in Education and Engineering. Using interpretive phenomenology, I was able to examine and interpret both the commonalities and differences

in the lived experiences of women doctoral students in relation to the contexts of the doctoral program, department, institution, and either the Education or Engineering field. Because the underlying meaning of the doctoral experience not have been apparent to the women doctoral students who participate in the study, interpretive phenomenological analysis allowed me as the researcher to uncover those hidden meanings by examining the women's lived experiences as they understand them.

Another philosophical assumption of the interpretive phenomenological approach (IPA) is that the researcher's expert knowledge is considered a valuable tool for inquiry. Specifically the philosopher Heidegger (1962) claimed that the researcher's background and knowledge are integral for determining how the method of inquiring about an understudied topic should proceed (Lopez & Willis, 2004). As a researcher, I am explicit about my preconceptions and previous experience as a woman currently pursuing a doctoral degree in Education and its influence on my research in Chapter One. Also, I will discuss how my perspectives and experiences as a woman doctoral student have influenced my choices for data collection and analysis methods later on in this chapter.

Critical Feminist Research

Interpretive (hermeneutic) phenomenology embraces the use of a theoretical orientation to focus the research questions, methods of inquiry, and most importantly the interpretation of the findings (Lopez & Willis, 2004). As discussed in Chapter Two, critical feminist theory guided this study, and thus the assumptions of feminist research, which are compatible with those of qualitative research, must be addressed (Ropers-Huilman & Winters, 2011; Sprague, 2005). Critical feminist research assumes that gender is a necessary lens through which human experience in interpreted, as gender affects all

aspects of being. Because feminists recognize that we live and work in a patriarchal society that privileges men's viewpoints, feminist research is grounded in the belief of the value that women bring to society through their lived experiences (Ropers-Huilman & Winters, 2011). My study attempts to examine and interpret the meaning of women's doctoral student experiences and degree progress using a critical lens by raising consciousness to women doctoral students of the ways in which the socio-cultural systems of doctoral education represent patriarchal values and how these systems may disadvantage or oppress them as they pursue the doctoral degree (Tong, 2009). Finally, feminist research is concerned with effecting positive social change in women's lives (Denzin & Lincoln, 2005; Lather, 1986/1991). By critically examining the gendered context of doctoral education culture in Education and Engineering, and the ways in which it influences women's doctoral degree experiences and degree progress, I hope to encourage or enable these women to take action to improve their own or other women's doctoral experiences, and the likelihood of doctoral degree completion in the direction of achieving gender equality in both fields.

Researcher Perspective

Since this is a qualitative study, I understand that I am the primary instrument through which the data is collected, analyzed, and interpreted, and therefore I am aware that my prior experiences and preconceptions about the nature of women's doctoral student experiences in Engineering and Education inevitably will shape my decision making processes. My interest in women doctoral students' experiences, in particular in female-dominated disciplines like Education has grown directly from my own observations and experiences when I was a doctoral student pursuing a Ph.D. in a sub-

field of Education. Throughout my doctoral student experience, I have observed or had conversations with several female colleagues at a variety of doctoral granting institutions about their experiences of overt and more often covert sexism in the way that their institutional departments and doctoral programs are structured and the academic expectations from faculty about what it takes to be a successful doctoral student. These observations and experiences have consequently fueled my interest in doctoral education, and in particular women's doctoral experiences and degree progress.

In addition, I acknowledge and am explicit about the fact that I bring a critical feminist perspective to my research. Critical feminism aims to shed light on and raise consciousness of the ways in which assumed to be "gender neutral" organizational culture and structures, created within and operated by a patriarchal society, contribute to and perpetuate existing gender inequities between men and women (Tong, 2009). Thus, in conducting my research, my experiences with gender inequity and subtle forms of institutional sexism in the academy inevitably influenced the questions that I asked as part of my data collection. Throughout my data collection and analysis, I will focus on the gendered aspects of women's doctoral experiences and doctoral education culture within Education and Engineering in order to understand how these gendered experiences, and the contexts in which they take place, affect women's doctoral degree progress.

Site and Participant Selection

I used purposeful sampling to select two comprehensive doctoral-granting institutions, according to the 2005 Carnegie classification system – one institution containing a graduate school of Engineering and another institution containing a graduate

school of Education. My final participant sample consisted of 11 women enrolled in five different doctoral programs at Northeast Institute Engineering School (NIES) and 10 women enrolled in five different doctoral programs at Northeast University Education School (NUES). A purposeful sample was used to effectively capture the essence of women's doctoral experiences in these two fields and to conduct a comparative analysis (Patton, 2002). The two institutions for my study are the Northeast University, a private doctoral-granting institution located in the Northeastern United States, and Northeast Institute, a science, engineering, and technology-focused institute also located in the Northeastern United States. These two institutions were selected because they represent institutions that have historically well-established doctoral programs in Education and Engineering, respectively, are perceived as the "trend setters" for excellence in Education and Engineering doctoral education, respectively, and are similar in terms of overall institutional prestige and reputation. First, I describe the two graduate school sites, the Northeast University Education School (NUES) and Northeast Institute Engineering School (NIES), and then I describe my final sample of 21 women enrolled in doctoral degree programs in Education at NUES and Engineering at NIES.

Northeast University Education School (NUES)

The Education graduate school resides within Northeast University, a research-oriented doctoral granting university in the Northeastern United States. NUES is consistently nationally ranked as one of the best Education graduate schools in the United States and offers a doctoral degree in Education in five sub-specialties: Educational Policy and Leadership, Human Development, Community and Diversity Education, Educational Research, and Higher Education. Approximately 75% of the doctoral

students enrolled in Fall 2011 were women, and 95% of doctoral students enroll full-time. The structure of the doctoral program in Education at NUES is comprised of three phases: coursework, qualifying examination, and dissertation stage. The doctoral program prefers that applicants have completed a master's degree upon entry into the 64-credit doctoral program, however a master's degree is not required. Coursework consists of 16 courses which are completed within three years after admission into doctoral study. After coursework is completed, students complete a qualifying paper proposal, a qualifying paper, and a dissertation proposal before they are considered doctoral candidates and enter the final dissertation phase. Doctoral students complete an oral dissertation proposal defense hearing but do not have to complete an oral dissertation defense; doctoral students simply submit the final document once it is approved by the committee. Education doctoral students are fully funded for a maximum of five years which includes full-tuition, health insurance and a fellowship of approximately $10,000 in the first year, and students typically work as research or teaching assistants in years two through five for which they can receive a minimum of $19,000 each academic year. Education doctoral students who receive institutional funding in the form of fellowships or research or teaching assistantships are required to pursue their doctoral degree as full-time students. Doctoral programs in Education at NUES prepare students to assume academic and leadership roles in the academic, government, policy, research, and professional practice arenas (NUES, 2011).

Northeast Institute Engineering School (NIES)

The Northeast Institute Engineering School (NIES) resides within Northeast Institute, a research-oriented doctoral granting university located in the Northeastern

United States. NIES offers both undergraduate and graduate degrees in Engineering, and is consistently nationally ranked as one of the best Engineering graduate schools in the United States for excellence in Engineering doctoral education. Approximately 30% of the more than 6,200 graduate students at Northeast Institute are women, and this percentage has been consistent over the last five years, but only 24%, of the more than 1,700 doctoral degree students enrolled at NIES in Fall 2011 were women. The majority of Engineering students pursue doctoral study full-time, and it typically takes these full-time students take five years to earn the doctoral degree. NIES currently offers the doctoral degree in seven Engineering sub-specialties: Aeronautics and Astronautics, Biological Engineering, Chemical Engineering, Civil and Environmental Engineering, Electrical Engineering and Computer Science, Materials Science and Engineering, and Mechanical Engineering.

NIES doctoral programs in Engineering require that students complete three major components: coursework, qualifying examinations, and doctoral thesis (dissertation) research. Typically, Engineering doctoral students complete two years of coursework in a major field of study within Engineering and some programs require a minor field of study outside of the student's major field. Engineering doctoral students receive a master's degree en route to earning the doctoral degree once they pass a written examination of their knowledge of the sub-field, and an oral examination where students present and respond to questions about their research in the lab to a faculty committee who ultimately decide whether the student is admitted into doctoral study as a doctoral candidate. At the thesis stage, doctoral students develop their own original research thesis in consultation with a thesis committee of faculty in the department who work with

the student in the research lab or who have similar research interests. The thesis faculty committee advises the doctoral student on his or her research thesis proposal, proposal defense, and final thesis defense. Typically, the examination and thesis process takes an additional two years, and so the doctoral students complete the doctoral degree within four or five years of full-time study. The majority of NIE Engineering doctoral students are funded through research assistantships which pay for full-time tuition, health insurance, and a monthly stipend of approximately $2,500 for the duration of the student's academic program. NIE doctoral programs prepare students to assume research and/or leadership roles in both academia and industry in Engineering (NIES, 2011).

Participant Selection

I used purposive sampling from the population of women doctoral students currently enrolled full-time in their second year or beyond in their doctoral degree program in either Education at NUES or Engineering at NIES but have not yet completed the degree in the current semester (Patton, 2002). The reasoning for excluding first-year doctoral students from my sample is first-year women will not have had sufficient time to become socialized into the culture of their doctoral program, institutional department, and academic field/discipline. Since almost all of the doctoral students studying Education at the Northeast University and Engineering at Northeast Institute are enrolled full-time, my sample included only full-time women doctoral students for the purposes of comparison. The guidelines for determining the sample sizes for purposive sampling relies on the concept of data "saturation", that is, "the point at which no new themes are observed in the data" (Guest, Bunce, & Johnson, 2006, p. 59). Although the research varies on the sample sizes needed to reach saturation for phenomenological studies, Guest, Bunce &

Johnson (2006) recommended a sample size of no more than 12 participants per group of interest, in particular for interviews. Thus, I initially interviewed 11 Education women at NUES and 12 Engineering women at NIES. One of the Education women did not complete all three interviews, and so I withdrew her from the study and the analysis, and one of the Engineering women I interviewed did not meet the criteria. My goal was to achieve maximum variation when sampling within each Engineering and Education graduate school to ensure there is representation across a few demographic dimensions including doctoral program sub-specialty, race/ethnicity, citizenship, and marital status/motherhood. These aspects were of particular importance because of the inter-sections of these various aspects of one's identity with gender. That is, these women's identification as women is inextricably linked to and cannot be parceled out from other components of the self, namely the doctoral sub-specialty (e.g. identification as a mechanical engineer student/professional), race/ethnicity (e.g. identification as a Black, Asian, Hispanic, multi-racial, etc.), and marital status/motherhood (identification as a single woman or wife, or a mother of children).

Data Sources

Since this study aims to capture the "essence" of women's doctoral experiences and how they relate to doctoral degree progress in Education and Engineering, the unit of analysis for this study is women doctoral students and their experiences while enrolled in Education or Engineering doctoral degree programs. The data for this study came from two sources: three semi-structured interviews with 10 Education women and 11 Engineering women doctoral degree students, and two focus groups with a subset of the Education and Engineering women interviewed. These methods are described in further detail.

Phenomenological Interviewing

To better understand women's gendered doctoral experiences and their perceived barriers to and supports for doctoral degree progress in each field, I used Seidman's (2006) three-phase structure for phenomenological interviewing. The purpose of this type of interviewing is to provide an in-depth description and interpretation of the meaning of a phenomenon that is shared among a group of individuals (Marshall & Rossman, 2006). In this study, the individual women shared the experience of being women enrolled as doctoral degree students in either Engineering or Education doctoral programs at the same institution. Phenomenological research requires multiple in-depth interviews with the participants (Creswell, 2007; Moustakas, 1994) and the interview structure "involves an informal, interactive process and utilizes open-ended comments and questions" (Moustakas, 1994, p. 114). As such, my interview guide was semi-structured and consisted of questions and prompts which were open-ended to allow the women freedom to discuss aspects of their experiences and narrate their own stories. The data collection included a total of 63 interviews and two focus groups with the final sample of 21 doctoral women across a three-month time period, from May 1 to July 31, 2012. I conducted the three semi-structured interviews with each of the 10 women in Education doctoral programs at NUES and 11 women in Engineering doctoral programs at NIES. The first set of interview questions focused on setting the context of these women's doctoral experience by focusing on the individual's educational and professional background or "life history" and motivations for pursuing doctoral study (see Appendix A). This first interview lasted 45 minutes. One to two weeks later, I interviewed the same women a second time. The second interview questions focused on the concrete details of the women's present doctoral experiences, in

particular means of financial support, the faculty advisor, and the department and program environment, since these are the most critical aspects of the doctoral experience cited in the research for understanding degree progress and completion (Bair & Haworth, 2004; Nettles & Millett, 2006; Seidman, 2006; CGS, 2009; see Appendix B). One week after the second interview, five of the 10 Education women, and six of the 11 Engineering women participated in a 90-minute focus group, which is described below.

The third and final individual interview took place two weeks after the focus group and built upon what was shared during first two interviews as well as what was discussed in the focus group about doctoral education culture. This third interview asked the women to "reflect on the meaning" of their experiences within the context of their lives and the culture of their doctoral program, institutional department, and academic field (Seidman, 2006, p. 18). Questions for the third interview focused on the meaning of gender to the doctoral experience and the connections between their gendered environment and their doctoral experiences, and how these environments and experiences have influenced their degree progress (see Appendix C). Two weeks was needed in between the focus group and final interview to allow the women sufficient time to reflect and make meaning of what was discussed in the first two interviews and the focus group before sharing those reflections in the third and final interview. Each of the three interviews was digitally recorded and then transcribed manually.

Focus Groups

The second data source was two focus group interviews. The research on focus group interviewing recommends that a focus group consists of seven to 10 individuals (Rossman & Rallis, 2003; Stewart, Shamdasani, & Rook, 2006). Thus, I facilitated two

focus groups separately – one focus group of five of the 10 Education women doctoral students I interviewed at NUES and six of the 11 Engineering women doctoral students I interviewed at NIES. The focus groups were conducted separately to enable each group of women to share their perceptions and lived experiences with other doctoral women in their graduate school. Also, group interaction and discussion is an effective format for facilitating the production of ideas that may have not emerged from other data sources (Stewart, Shamdasani & Rook, 2006). The question prompts for the focus groups asked each group of women to characterize doctoral education culture as it exists within their department and doctoral program, and within the field of Education or Engineering. Also, the women discussed their perceptions of the support for and barriers to doctoral degree progress (see Appendix D for focus group interview protocol). The focus group occurred between the second and third interview so to allow enough time for the women to build a rapport with me as well as each other and also provided an opportunity to build upon their individual experiences previously discussed in the first two interviews.

Data Collection

I was able to gain access to the graduate students at NUES and NIES by contacting the graduate program administrators responsible for the Education and Engineering doctoral student listservs. These administrators agreed to disseminate information about the purpose of my study to women doctoral students enrolled in the five Education sub-specialties at NUES and seven Engineering sub-specialties at NIES, respectively, via email after receiving approval by the human subjects institutional review board (IRB) at Boston College.

After receiving approval from Boston College IRB, the five department chairs at the Northeast University and seven graduate department chairs at the Northeast Institute sent the IRB-approved sample inquiry letter I prepared to all of the women doctoral students currently enrolled full-time in their second year or beyond of doctoral study within their academic department. In the sample inquiry letter, I explained the purpose of my study, the confidentiality I would maintain throughout the course of the research, the benefits and the minimal risks of volunteering to participate, and the compensation structure for those women chosen as participants. One potential, yet minimal risk, of participating was through the process of talking about their doctoral experience, the women experience some emotional distress. I reminded the participants that they can opt out of the study at any time provided links to available resources in case they needed to seek counseling. The incentive for participation was a VISA or AMEX gift card worth $75 for each woman participant to be paid in three separate installments of $25 after each of the three interviews. The focus group participants received a free lunch during the focus group discussion as an incentive to participate.

Twenty-three women responded to my initial inquiry email and completed an online participant survey to determine their eligibility for the study (see Appendix E for Participant Eligibility Survey). This survey confirmed whether they were studying an Education sub-field at NUES or an Engineering sub-specialty at NIES and that they were doing so full-time and were enrolled in at least their second year of doctoral study. After completing and signing the informed consent form, I asked each of the twenty-three eligible women (11 Education, 12 Engineering) to complete a more in-depth Participant Demographic Information Form (Appendix F) which asked more specific background

information about the women participants, such as their doctoral program sub-specialty, when they began doctoral study, age, race/ethnicity, marital status, and whether they have children. This demographic sheet was only used to connect participants' names with their identities. Participant data was secured and locked in the researcher's confidential files. The final sample of women who completed all three interviews consisted of 10 Education women and 11 Engineering women for a total of 21 women from the original 23 women recruited. The researcher voluntarily withdrew one Engineering woman and one Education woman from the original sample because the former was not eligible for the study after the interviews were completed, and the latter did not complete all three interviews and therefore was excluded from the final sample. The purposeful sample of 11 Engineering women at NIES and 10 Education women at NUES represented the maximum variation across doctoral program sub-specialty, race/ethnicity identification, and marital status/motherhood (Patton, 2002), since these factors cannot be parceled out from their gender and identity as women.

Data Analysis

Before I began data analysis, all personal identifying information in the interviews and focus group transcripts were changed order to protect the identity of the two institutions and the individual women participants. Each of the 21 women chose their own pseudonyms. I created password-protected electronic files with the only demographic information linking the interview and focus group transcripts to the participants. The interview and focus group transcripts were professionally transcribed and the licensed transcription service assured confidentiality in all client agreements.

The overarching purpose of my data analysis was to uncover the deep, and often hidden, meaning of the lived experiences of currently enrolled women doctoral students in Education and Engineering. First, the text from the 63 semi-structured interview transcripts and two focus group transcripts were uploaded into Hyper Research, a qualitative data analysis software program, to store, organize, and code the data. When analyzing the data, I used a critical feminist socio-cultural approach. This approach seeks to examine and derive meaning about the gendered aspects of doctoral education culture and structure, as well as the women's doctoral experiences and supports and challenges to degree progress within each field.

As Geertz (1973) states, the advantage to using a socio-cultural lens is that it is dynamic in allowing the qualitative researcher to treat culture and social structure as both independent and mutually interdependent variables. "Culture is the fabric of meaning in terms of which human beings interpret their experience and guide their action; social structure is the form the action takes . . .Culture and social structure are then but different abstractions of the same phenomena" (p. 145). Socio-cultural analysis is a beneficial tool for teasing out the origins and gendered aspects of both culture and structure in Education and Engineering doctoral education and the ways in which they abstract the phenomenon of women's lived doctoral experiences and degree progress. Using a critical feminist approach, I specifically focused on comparing and contrasting the gendered nature of women's doctoral student experiences and their perceived supports and barriers to doctoral degree progress in Engineering and Education in light of societal gender schemas about expectations of doctoral students in each field.

Greenhalgh & Wessely (2004) claim there are three levels for analyzing culture: "what people say they do, what they are actually observed to do, and the underlying (and often unconscious) belief systems that drive their behavior" (p. 199). All three levels of culture were analyzed using three different qualitative coding methods. For the initial phase of data analysis, I composed a narrative summary of each of the 21 women's story by using the method of holistic coding to consolidate the interview transcript data into a narrative format. This technique involves grouping together whole sections of the interview transcripts that represented the different parts of each woman's "story" rather than analyzing the transcripts line by line (Saldana, 2009). These document summaries were then used to compare and contrast women's life histories, doctoral experiences, and reflections both within and across Engineering and Education doctoral programs. These summaries were shared with the individual women to check for accuracy of my representations and interpretations of their experiences.

The second step in the coding process was the initial coding. Both the interview and focus group transcripts were initially coded to assign and group the data into meaningful codes. Then the second round of data analysis involved focused coding in which the codes were clustered together to form categories to help identify commonalities and difference across the cases within each group of Education and Engineering women. These focused codes represented similarities and differences within each group of Education and Engineering women. Finally, patterned coding was used to identify relationships among the categories and generate overarching themes to describe the similarities and differences between the Education and Engineering women (Saldana,

2009). Four major themes resulted from the analysis, which was both an inductive and deductive process

The data from the two focus groups of women in Engineering and Education were analyzed using the same progressive coding methods described above but instead identified what doctoral students are "observed to do" in terms of their actual doctoral experience and the "underlying belief systems (often unconscious) that drive their behavior" as represented in the women's reflections about their perceptions of their doctoral department and program culture (Greenhalgh & Wessely, 2004, p. 199). Throughout the analysis, particular attention was paid to the ways in which the emerging themes are gendered and how various aspects of doctoral education culture and structure, and the lived experiences of these women exemplify gender. My analysis focused on interpreting the meaning that these 21 women made from their doctoral experiences and environments, the nature of the relationship between these environments, their doctoral experiences and in turn their intentions to move forward in their doctoral study, and the ways in which women may be advantaged and/or disadvantaged as a result.

Trustworthiness and Limitations

Questions about the trustworthiness of qualitative phenomenological research seek to ascertain the "truth value" or accuracy of the findings reported, the rigor of the methods used to generate the findings, and its usefulness for other contexts (Rossman & Rallis, 2003, p. 65). I employed three strategies to ensure the trustworthiness of the data. First, to ensure that the data and conclusion are based on the reality of participants' views, at the completion of the three individual interviews, I composed a three to four-page narrative summary of what the individual participant shared with me throughout the

course of the study, and I provided a copy of the narrative summary to each participant to review and check for accuracy. Also, I directly referenced participants' voices when presenting my findings in Chapter Six (Findings) and analysis and interpretation (Chapter Seven), in order to support the conclusions that resulted in Chapter Eight.

Second, I collected evidence from two different data sources (interviews, focus groups) so that I could triangulate the data and make in-depth interpretations about the complexities of women's lived experiences and doctoral degree progress in Education and Engineering at the two sites in my study. Third, I have disclosed and provided a rich description of my theoretical orientation in the data collection and analysis process. I approached this research from a critical feminist perspective and seek to uncover and share women's experiences and voices as legitimate sources of knowledge (Ropers Huilman & Winters, 2011). I have provided as much detail as possible about the institutional and departmental contexts of my study, while protecting the identities of the participants and the two institutions, for others to determine the usefulness of my findings about women's doctoral degree experiences and whether they may be applicable to other women doctoral students studying Education or Engineering at other institutions.

This study has three main limitations. First, the conclusions made about the culture of doctoral education in Engineering and Education will be based on a small sample of 21 full-time doctoral students, which 10 women at one Education graduate school and 11 women at one Engineering graduate school. Thus, the perceptions and interpretations of the women, doctoral programs, departments, and institutions sampled in this study do not reflect the experiences of women part-time students, or the culture of doctoral education in Engineering and Education at other institutions or within other fields at the two institutions

sampled. A second limitation is the findings in this study reflect the perceptions of the 21 women sampled in this study during a particular point in time at which the data was collected or the narrative summary was reviewed (May through July 2012 for data collection, August – October 2012 for member checking of narrative summaries). Thus, more recent changes to the doctoral experience and the women's perceptions of that experience in the last year (2013) are not reflected in this dissertation study's findings. The third and final limitation is that the study does not attempt to describe the concrete details of every aspect of each woman's doctoral experience, nor does it attempt to suggest that women's doctoral experiences are different from those of men within the same doctoral programs at the two institutions sampled. This study provides an opportunity for a direct comparison of women's experiences in two highly gender-stratified fields where women are most and least likely to complete doctoral degrees at two institutions similar in academic prestige and climate. One strength of this research design is that it provides an opportunity for an in-depth understanding of the lived experiences of an understudied population –that is, women doctoral students pursuing doctoral degrees in the female-dominated field of Education. The final sample of 10 Education women and their stories are presented in Chapter Four, followed by the 11 Engineering women's stories in Chapter Five.

CHAPTER FOUR: EDUCATION DOCTORAL WOMEN PROFILES

In this chapter, I provide an overview of the final sample of 21 doctoral women who participated in the study, followed by a brief summary of each woman's story. The final sample consisted of 10 Education doctoral women currently enrolled at the Northeast University Education School (NUES) and 11 Engineering doctoral women enrolled at the Northeast Institute Engineering School (NIES). Each woman's story focuses on four topics: 1) motivations and initial impressions of doctoral study; 2) the doctoral experience; 3) supports and challenges to degree progress; and 4) the gendered environment of the department and doctoral program.

Overview of Sample

The criterion for inclusion in the final sample was based on full-time enrollment in doctoral study for at least one academic year at the time of the first interview**.** Overall, both groups of Education and Engineering women represented the variation that exists within each institution's graduate school across sub-specialty/department, phase in doctoral program, race/ethnicity, citizenship, age, and marital status. The demographic characteristics of each group are shown below in Table 1.

Table 1: Demographic Characteristics of Final Sample of Doctoral Women

Characteristics	Education Women at NUES (n=10)	Engineering Women at NIES (n=11)
Sub-specialty/Department	4 of 5 sub-specialties represented: • Educational Leadership and Policy (n=2) • Human/Brain Development (n=3) • Community and Diversity Education (n=2) • Higher Education (n=3)	5 of 7 departments represented: • Aeronautics and Astronautics Engineering (n=3) • Biological Engineering (n=1) • Chemical Engineering (n=1) • Civil (n=1) and Environmental Engineering (n=3) • Materials Science Engineering (n=2)
Doctoral Program Phase	2nd Year: 1 (30%) 3rd Year: 3 (30%) Qualifying Exam: 1 (10%) Dissertation: 5 (50%)	2nd Year: 3 (27%) 3rd Year: 1 (9%) Qualifying Exam: 0 (0%) Dissertation: 7 (64%)
Race/Ethnicity	White: 5 (50%) Non-White: 5 (50%) Black/African American: 3 Hispanic/Latino: 1 Asian/Asian American: 1	White: 7 (64%) Non-White: 4 (36%) Asian/Asian American: 1 Indian: 1 Middle Eastern: 1 Multi-racial: 1
Citizenship	US: 10 (100%) Non-US: 0 (0%)	US: 8 (73%) Non-US: 3 (27%)
Age	30 & Under: 2 (20%) 31 & Over: 8 (80%)	30 & Under: 9 (82%) 31 & Over: 2 (18%)
Marital Status	Single: 1 (10%) Married/Cohabiting: 9 (90%)	Single: 7 (64%) Married/Cohabiting: 4 (36%)
Children (under age 18)	Children: 4 (40%) Age 0 – 5: 3 Age: 6 – 12: 1 No Children: 6 (60%)	Children: 0 (0%) No Children: 11 (100%)

The 10 Education women and the 11 Engineering women exhibited similar characteristics with respect to diversity in sub-field, doctoral program phase, and race/ethnicity. The Education women represented all the sub-specialty within Education offered at NUES with the exception of the Educational Research, and the Engineering women represented five of the seven departments – only Electrical and Computer Science Engineering and Mechanical Engineering were missing. Five of the 10 Education doctoral students were non-White which is a slightly greater proportion than in Engineering, in which 4 of the 11 Engineering doctoral students were non-White.

However, there are differences between the participant samples with respect to citizenship, age, and marital status. All the Education women are U.S. citizens whereas three of the 11 Engineering doctoral women are international students studying in the U.S. with a visa. The most noticeable differences between Education and Engineering fields are the age and marital status of the participants. The Education women are overwhelmingly older and are married or in cohabiting relationships, since all of them had at least three years of professional experience as teachers, administrators, or researchers and almost all of them earned a master's degree prior to enrolling in their doctoral program. In contrast, the Engineering women are younger since they tended to pursue doctoral degrees immediately after completing college and earn a master's degree along the way. For the initial phase of data analysis, I composed a narrative summary of each of the 21 women's story by using the method of holistic coding to consolidate the interview transcript data into a narrative format. This technique involves grouping together whole sections of the interview transcripts that represented the different parts of each woman's "story" rather than analyzing the transcripts line by line (Saldana, 2009).

Education Doctoral Women Profiles

Each of the 10 Education women in this study had a unique story to tell about her own motivation to pursue doctoral study in Education at NUES, her doctoral experiences while at NUES, and the supports and challenges to degree progress she experienced as a woman in the female-dominated field of Education. What follows are the stories of 10 Education doctoral women, told in ascending order, starting with women in the earlier phases of their doctoral program and ending with women who have recently completed their degree and one who is still working on her degree after seven years. Michelle is a second-year doctoral student still in the coursework phase; Laura, Louisa, and Marie are third-year doctoral students completing coursework and working on the qualifying paper, and Alicia is a third-year doctoral student who finished her qualifying paper and is beginning her dissertation proposal and research. The remaining five women are all in the dissertation stage of their degree program. Nicole is a sixth-year doctoral student writing her dissertation proposal, Elizabeth is a seventh-year doctoral student in the data analysis and writing stage of her dissertation; Karen just began her eighth year as a doctoral student and is in the final stages of editing her dissertation; Rachel is a sixth-year doctoral student who recently completed her degree in Spring 2012; and finally, Brenda is a seventh-year doctoral student in the data analysis phase. Brenda will complete her dissertation in Fall 2014. A summary table of the 10 Education women is below.

Table 2: Demographic Characteristics of Education Doctoral Women

Name	Sub-Specialty	Doctoral Program Phase	Citizenship	Race/ Ethnicity	Age	Marital Status	Children (#, age)
Michelle	Community and Diversity Education	2nd year, Coursework	U.S. Citizen	Black/ African American	21-25	Cohabiting	None
Laura	Educational Leadership and Policy	3rd year, Coursework/ QPaper	U.S. Citizen	White	26-30	Cohabiting	None
Louisa	Higher Education	3rd year, Coursework/ QPaper	U.S. Citizen	Black/ African American	31-35	Single	#: 1 Age: 12
Marie	Higher Education	3rd year, Coursework/ QPaper	U.S. Citizen	Asian/ Asian American	31-35	Married	None
Alicia	Human/Brain Development	3rd year, Dissertation Proposal	U.S. Citizen	Hispanic	31-35	Cohabiting	None
Nicole	Higher Education	5th year, Dissertation Proposal	U.S. Citizen	Black/ African American	36-40	Cohabiting	None
Elizabeth	Community and Diversity Education	7th year, Dissertation Data Collection	U.S. Citizen	White	36-40	Married	#: 1 Age: 4
Karen	Human/Brain Development	8th year, Dissertation Editing	U.S. Citizen	White	41-50	Married	None
Rachel	Education Leadership and Policy	6th year, Dissertation Complete	U.S. Citizen	White	31-35	Married	#: 2 Age: 1 (twins)
Brenda	Human/Brain Development	7th year, Dissertation Data Analysis	U.S. Citizen	White	41-50	Married	2 Children Age: 3,6

Michelle, The Promising Academic (2nd year Student, Coursework Phase)

Motivation for and impressions of doctoral study. Michelle is a Black woman in her mid-twenties and is a second-year doctoral student studying Community and Diversity Education at NUES. Michelle grew up in Chicago and attended a private

university in the mid-West. Michelle did not seriously consider graduate school until her sophomore year when her undergraduate advisor encouraged her to apply for a Mellon fellowship. Michelle was attracted to the university life because she saw how her professors used their position to help the surrounding community. She originally became interested in Education while student teaching in college. After graduation, Michelle taught middle school for three years and earned her Master's degree in Elementary Education. Michelle decided to apply to doctoral degree programs in Education because the degree would give her more power to effect change in the public school system which she was unable to do as a teacher. Her decision to attend NUES came down to money, Northeast University's "cache", and the fact that her boyfriend got a job in the area. Upon arrival, Michelle perceived Northeast University as an institution of opportunity and welcoming of diverse perspectives. She originally perceived the program structure as "mystifying" and some of the faculty to be disinterested.

Doctoral student experiences. As a second-year student, Michelle takes four courses each semester and is working on her Qualifying Paper (QP). In the spring of her first year, she served as teaching assistant (TA) for one course which paid her $4,500 for the semester. Michelle received a Presidential fellowship from Northeast University which covers five years of tuition, and an annual stipend of around $20,000 during years one, two, and five in the doctoral program. In years three and four she will work as a research assistant (RA) or TA to earn the same stipend amount. She also has her Mellon fellowship from her undergraduate institution which will cover some of the costs of her dissertation research. Michelle believes that the fellowship she receives from NUES is

adequate to cover the cost of living, but she says without the fellowship it would be impossible to support herself.

Michelle has a tenured female faculty member as her primary advisor. Although Michelle says their relationship is not "ideal" in that her advisor is not frequently available to meet with her weekly, Michelle does value the quality of the feedback she receives during their meetings, which occur about 5 times during the semester. She has to formally schedule her advising appointments with her advisor's executive assistant. Michelle perceives NUES culture to be "in flux", since the Ed.D. program will eventually be replaced by a Ph.D. program in the coming years. She says that NUES values scholarship, and the peer culture is non-competitive. She also says NUES is accepting of pregnant women and mothers.

Degree progress and the gendered environment. Michelle said that advanced doctoral students and her cohort have been the most salient factor for her degree progress. She also pointed to the module courses offered during the winter break term as helpful because they are an efficient way to complete course requirements. These topic-focused classes are taught by advanced doctoral peers and enable students to earn 3 credits in six weeks. Michelle said that the lack of qualitative research methods and content courses related to her research topic has been a challenge to her degree progress.

Michelle says she brings a feminist perspective to her doctoral experience and being a woman has been positive. Michelle perceives that women and people of color rely on interpersonal networks as opposed to formalized structures for seeking guidance because it is more comfortable, and those networks are present at NUES. Michelle hopes to complete her degree within five years. She is uncertain about her career path right

now, but she knows she wants to work in public education with children. She could also see herself as an academic, educational leader, or a superintendent.

Laura, A Student of Two Different Worlds (3rd Year Student, Ending Coursework and Qualifying Paper Phase)

Motivation for and impressions of doctoral study. Laura is a White woman in her late twenties and a third-year doctoral student studying Educational Leadership and Policy at NUES. Laura grew up in the San Francisco Bay area and was very active on the debate team at her high school. Laura attended a liberal arts college in the Pacific Northwest mainly because she wanted to continue with debate. While most of her debate team friends majored in Politics, Laura decided to major in Studio Art. Laura became interested in Educational Policy through her dad, since he was a public school teacher, and teaching debate at summer camps. After graduating college, Laura worked for a small company owned by her high school debate coach which sponsored academic programs on college campuses for middle and high school students. She followed her passion for both Education and Policy and earned a Master's degree in Educational Policy from a private university in the Northeast. She decided to pursue a doctoral degree at NUES because she had only "scratched the surface" in learning about Educational Policy. Laura came to NUES because the professors and focus of the program were a good fit. She liked that NUES doctoral students could craft their own program of study.

Doctoral student experiences. Laura is just beginning her third-year at NUES, and last semester she took a full load of four courses each semester. To pay for the cost of her doctoral education, Laura served as an RA and a TA throughout the past two years. During her first year, Laura received the $10,000 fellowship that is given to all incoming

first-year doctoral students. In addition, Laura worked as an RA 20 hours per week. During her second year, Laura worked on short-term research projects in addition to serving as a TA for a statistics class. Laura did not take out loans to pay for the cost of her education, but she usually holds three to seven part-time, short-term jobs each year to make ends meet. She does not think that the NUES funding package is adequate for covering the cost of living in the area.

Laura has had the same male advisor for the past three years. Her advisor is a junior professor whose class she serves as a TA, and she is very satisfied with the advising relationship. Overall, Laura believes that her advisor has had a significant impact on her doctoral experience and her degree progress because her advisor is "in her corner" and has helped her work through the qualifying paper (QP) milestone and the process of conducting original research. Laura perceives the culture of NUES to be warm and friendly, and generally the doctoral student culture is not hypercompetitive. Laura says NUES emphasizes research, policy, and practice, and educational equity. She says that the NUES faculty value the use of quantitative research methods to answer these questions.

Degree progress and the gendered environment. Laura says her advisor has been particularly helpful for her degree progress because he provides constant support, encouragement, and a valuable perspective. She also mentioned that the financial stipend during the first year, the knowledgeable support staff in the doctoral program office, and the degree progress memos were also helpful. Degree progress memos are written summaries that doctoral students compose at the end of each academic year of their academic, research, and teaching activities throughout the past year and also the planned

degree progress goals and milestones for the next academic year. One of Laura's biggest challenges in her degree progress has been figuring out her research topic and questions for her qualifying paper.

The only gender differences that Laura observed was that her quantitative research classes consisted mostly of male doctoral students. Laura was encouraged by her male advisor and a male professor at NUES to take more quantitative methods courses. Nevertheless, Laura mentioned that being a woman makes it harder to form a close bond with her male professors who often teach the majority of those quantitative methods courses. Laura thinks the reason for this is in part due to a lack of interest by women in math and also men tend to be more confident in math and are more willing to take the initiative to form a relationship with other male professors whom they view as a role model. Laura believes that Education doctoral programs provide a more supportive environment to both women and men than other graduate schools within Northeast University but the NUES doctoral program didn't provide equal support to both genders. When asked to elaborate, Laura could not articulate what exactly she meant. However, in the focus group she was in agreement with her peers that men's views were more often solicited by female professors who were overly conscious of including men, who were the minority, in classroom discussions. However, Laura said this only occurred in her female-dominated Education classes rather than her male-dominated quantitative methods classes.

Louisa—An "N of One" as a Single Mother (3rd year student, Ending Coursework and Qualifying Paper Phase)

Motivation for and impressions of doctoral study. Louisa is a Black woman in her mid-thirties and is third-year doctoral student studying Higher Education at NUES. Louisa was born in a Caribbean island, and at the age of 15, she and her mother moved to New England. Louisa attended college in New York City as a way to experience "America." Louisa studied Sociology, and after graduating, she became pregnant with her son. As a single mother, she needed to financially support her child, and so she landed a job working in curriculum administration at her alma mater institution. During the 13 years that she worked at a university in New York, Louisa's thinking transitioned from viewing the job as a method for financial support to viewing higher education as a career. Louisa decided earn a doctoral degree because she was intellectually curious. Louisa only applied to doctoral programs where she could enroll full-time. Louisa decided to attend NUES partly because of the institutional prestige, opportunities, and geographical proximity to her family. When Louisa first arrived at NUES she felt a strong sense of panic and began to question her decision to move her son to a new place. Her first impression of NUES was that it was K-12 oriented and the majority of the class material was not applicable to her interests in higher education.

Doctoral student experiences. As a third-year student, Louisa is finishing coursework and is working on her qualifying paper (QP). Louisa gets her son ready for school every morning before heading to campus. She usually stays on campus as if she had a normal work schedule from 8am to 4pm taking classes and conducting research, and then she will go home to her apartment to greet her son when he comes home from

school. Louisa's full tuition, fees, and health insurance is paid for by NUES, but her son's health insurance is not covered and Louisa thinks this is unacceptable. Louisa received a $10,000 stipend for the first year, and she also worked as a research assistant (RA) during her first two years to supplement the additional costs of living. During her third year, Louisa will serve as a TA. Louisa borrowed federal loans to help supplement the cost of living because the money she earns from her RAships is not enough. Louisa does not think NUES provides an adequate level of funding for doctoral students to study full-time, compared to other graduate schools within Northeast University.

Louisa was assigned a female faculty advisor based on her higher education concentration and has had this same advisor for the past two years. Louisa's advisor has oriented her to the institution and has guided her with selecting courses and defining her research interests. Now that Louisa has narrowed down her research interests, she questions whether her advisor's interests are aligned with her own and so she has considered switching advisors to the professor with whom she does research. Louisa perceives the NUES culture to be community-oriented, and more advanced doctoral students are willing to help the newer students. Louisa suspects that there is competition among students but says this competition is not apparent in the classroom. Louisa perceives the NUES culture to be very groupthink-oriented and dichotomous in its approach to Education-related issues.

Degree progress and the gendered environment. Louisa says that the freedom to develop relationships with other faculty members and her peers are helpful for her degree progress. Louisa talked about the helpfulness of a critical literature review course for forcing her to construct research questions for her dissertation. Louisa thinks that the

funding and the high cost of living is a challenge to her degree progress. For doctoral students who are on the academic track like herself, Louisa believes that having multiple jobs (especially teaching), detracts from conducting and publishing research. She believes the flexible structure of the doctoral program is also not helpful for her degree progress because she does not receive the feedback she needs in order to know if she is doing the right things (i.e. taking the right courses, participating in appropriate research and teaching opportunities) to prepare for her dissertation research and put her in a position to seek faculty positions once she completes her degree.

Louisa said she often felt alienated from the doctoral program as the only single mother doctoral student with a middle-school aged son. She mentioned feeling like an "n of one" because she doesn't fit into the typical demographic of women doctoral students at NUES as a Black woman, and as a single mother without a partner. Louisa says that NUES really cares about families, but she believes they aren't referring to single mothers like her; she believes that NUES conceptualizes the idea of motherhood solely within the context of a two-parent household. She sees how her White doctoral peers, all of whom are partnered or married, are emotionally supported and admired as mothers and as scholars by the administration and the faculty, who often have children themselves. However, Louisa says the administration often assumes that Louisa has someone to help her out financially and logistically with the care of her son. Louisa does believe that NUES, like all institutions, are gendered institutions. She believes that the behaviors that are rewarded are those behaviors that come easily to men; men still dominate classroom conversations at NUES just like at other institutions. Louisa hopes to complete her degree by 2015, within the five-year tuition funding limit. Louisa's career goals have changed

throughout her doctoral program. Originally, she wanted to return to higher education administration, but now is now considering academia and a career as a faculty researcher.

Marie – Undecided and Searching for Connection (3rd year Student, Coursework and Qualifying Paper Phase)

Motivation for and impressions of doctoral study. Marie is an Asian-American woman in her early thirties who just began her third year studying Higher Education at NUES. Marie grew up in the Northeast and attended a women's college. She double majored in Psychology and Music so that she could study abroad. Marie did not consider graduate school while in college because she did not intend to write a senior thesis and never perceived herself as one of the academic "super stars" who typically pursue doctoral degrees. After college, Marie worked for three years in arts administration at a music conservatory in the Northeast. However, she quickly observed that many of the successful women in the field did not have any work-life balance.

Marie viewed Education as more of a personal calling. She applied to Master's programs with a focus in Higher Education and enrolled at NUES because the program was only one year, was geographically close, and she met the qualifications for admission. While in the Master's program, Marie realized that she had more questions and she decided to apply for doctoral programs, including NUES, after talking with her peer mentor. Marie ultimately decided to attend NUES because it was familiar. Marie wasn't impressed with the Northeast University name because she was already there as a master's student. However, she was impressed with the customized services and the experts that she had access to as a doctoral student. During the first year, Marie said other

doctoral students were not eager to form lasting relationships with one another because many already had a pre-existing social support system outside of NUES.

Doctoral student experiences. During her first two years, Marie took three or four classes each semester. Marie served as a TA for one class each semester which requires between 15 and 20 hours per week of work. NUES covers Marie's tuition, health insurance, and her TA position pays her about $4,500 per semester. In addition to being a TA, she works 10 hours per week doing consulting work to gain additional experience and earn money, even though her husband pays the majority of the living expenses. Marie doesn't think NUES provides adequate funding for a single person to live on, and without her husband she says she would be unable to financially support herself.

Marie has had the same female advisor throughout her two years in the doctoral program. Marie is not satisfied with the technical feedback she receives from her advisor because it is not specific enough. Marie mentioned that she has a secondary advisor at NUES whom she goes to for advice about networking opportunities. Marie perceives the NUES doctoral student culture to be politically very liberal. Marie described her doctoral peers as consisting of mainly women with "Type A personalities" which fosters an intense learning environment at times. NUES is more focused on the K-12 education system than higher education.

Degree progress and the gendered environment. Marie is finishing coursework and is in the beginning stages of writing her qualifying paper. Marie said that her peers, especially advanced doctoral students, have helped her degree progress because of the advice they provided about how to navigate the doctoral experience. However, this peer support is informal and students must be proactive in seeking out help. Marie identified

her doctoral seminar class, a full-year required course for all first-year doctoral students, as an impediment to her degree progress because the course content was not related to the dissertation development or research process and the final consulting project did not benefit her whatsoever. Marie also talked about the feeling of isolation and inadequacy as something she has struggled with throughout her degree program because she sensed that her peers were all smarter and more accomplished than she was.

Marie says that she is more sensitive to the gender inequities that exist within her program because she attended a women's college. Marie believes that men are given preference for research grant money and awards at NUES. For example, last year the doctoral men received slightly more than half of the departmental awards and research grant money, even though men represent about one-third of the doctoral students at NUES. Also, Marie said that in the classroom, she notices that men's viewpoints are more often solicited by the female faculty because the men are more vocal in the classroom and are more assertive about ensuring their voice is heard, despite representing the minority in number in the classroom. Marie is hoping to finish her doctoral degree in three more years in 2016. Marie views her training as preparation to be an educational researcher, and so she is considering a career in research or consulting at a non-profit organization, think tank, or research institute.

Alicia, The Ex-Teacher Seeking Scholarly Validation (3rd year Student, End of Coursework and Dissertation Proposal Phase)

Motivation for and impressions of doctoral study. Alicia is a Hispanic woman in her mid-thirties and a third-year doctoral student studying Human Development at NUES. Alicia grew up in Long Island and said she hated her schooling experience

because she didn't like being told what and how to learn. Alicia did not originally want to go to college, and so her sister and mother filled out her college and financial aid applications for her. Alicia ultimately attended a private university in New York because she received a full tuition scholarship and a stipend. Alicia switched her major to English Literature and finished her bachelor's degree in English in three years. Since she had one more year of scholarship funding, Alicia's advisor encouraged her to get a teaching certification in English Education. It was during her student teaching experience in college that Alicia fell in love with teaching. Alicia taught English and History at a series of small progressive schools in the New York City school district for 12 years but switched schools every two or three years because she was not willing to conform her teaching methods to the administration's ideas of teaching. Alicia earned her Master's degree in Science Education while teaching in order to maintain her teaching certification. After 12 years, Alicia decided to leave teaching altogether and instead applied to doctoral programs in Education because she could not get a teaching job in Education and she saw that K-12 senior-level administrators only listened to researchers with PhDs.

Alicia decided to attend NUES because for the first time, someone from an elite institution was validating her intellectual ideas. Alicia's first impression of Northeast University was that it was unrealistic, elite, and protective. When arriving at NUES, she perceived the environment as an escape from her torturous teaching experience. However, Alicia said she realized she didn't fit in with the NUES culture during her first year after becoming more acutely aware of NUES's racial and socio-economic prejudices about education and student achievement. Alicia believed that NUES faculty, as members

of the liberal elite, had prejudices about the inability of (minority) teachers to impart the knowledge necessary for low-income and minority students from disadvantaged backgrounds to "achieve," which was operationalized as a score on a state-wide exam. She perceived that these predominantly white faculty researchers thought they are the only ones who can "save" this population and solve the problem of achievement inequity.

Doctoral student experiences. Alicia is beginning her third year in the doctoral program and is currently finishing up her coursework and working on her dissertation proposal. When Alicia is not in class, she is working on her written assignments or on writing her dissertation proposal. Alicia purposely did not take on any teaching assistant (TA) positions because she had spent more than a decade teaching. Also, Alicia is fortunate enough that she doesn't have to TA for financial reasons because her partner helps pay for the living expenses. Alicia did take on a research assistant (RA) position during her first year but did not continue after because she didn't like the idea of doing work for someone else and take time away from her own research. Alicia's tuition, fees, and health insurance are covered by NUES for five years, and the first year of the NUES doctoral program Alicia received a $10,000 stipend which all doctoral students get. She does not think that the stipend NUES doctoral students are given is enough to live on as single adult in the Northeast area.

Alicia had two different advisors throughout her first two years at NUES. Alicia was assigned a female advisor when she began her first year in the doctoral program. She loved this advisor when they met during the summer before the doctoral program but this advisor went on sabbatical during Alicia's first semester. During the spring semester of her first year, Alicia met a tenured full professor while interviewing him for a class, and

she asked this male professor to be her advisor for the remainder of the doctoral program. Alicia says she is extremely satisfied with the quality of her advising relationship, although she wishes her advisor could give her more direction about the "nuts and bolts" of administrative processes. Overall, Alicia's advisor has had a positive influence on her doctoral experience and specifically his encouragement and validation of Alicia's research has helped Alicia's degree progress. One of the most significant aspects of Alicia's doctoral experience is that she says she experienced an identity crisis in which she became more acutely aware that entering the academic world may change the way other people of color might perceive her. Alicia perceives the doctoral student culture in her cohort as very isolated and individualistic whereas the faculty culture is that of the "liberal elite": faculty study disadvantaged populations without realizing that as elites they are reinforcing the inequalities between them and the populations that they study. She believes that NUES tries too hard to prove that it is a legitimate professional school within Northeast University.

Degree progress and the gendered environment. Alicia says her advisor is a major factor that has helped her degree progress thus far because the validation that he provides has enabled Alicia to remain motivated and move forward with finishing coursework and writing her qualifying paper and dissertation proposal. Alicia wonders why other doctoral women complain about the lack of structure and the need for more direction in the doctoral program. She says it might have something to do with how women are socialized to take direction from others – women feel uncomfortable when they aren't being told what to do. One of the challenges to Alicia's degree progress was the quality of the few required methods courses. Alicia considered some of the methods

and the first-year doctoral seminar as not valuable because they did not provide content or technical skills that are useful for dissertation development. Also, Alicia's doctoral cohort did not bond very well and not having the peer support negatively affected her experience, but she has not let it affect her degree progress.

Alicia didn't begin to realize how gender mattered to her doctoral experience until her second year at NUES. Alicia says her experience at NUES forced her to acknowledge how she was silently fighting the demeaning nature of being a woman in Education as a teacher all those years. Often teachers, like mothers, are expected to sacrifice their lives for the good of the children. While at NUES, Alicia also noticed how men's opinions and input were more often sought after by the female NUES faculty, even though they were the minority as doctoral students in the classroom. Alicia said she had no problem voicing her own beliefs and opinions but that is also her personality and it was not common for all of the women in her class to speak up. Alicia thinks the reason NUES female faculty called on male doctoral students more often because the men were already more vocal in the classroom. Alicia mentioned that the male doctoral students were also more proactive about forging strong relationships with their professors inside and outside of class in order to secure attractive research or teaching assistantships in the future. Instead, Alicia says that women doctoral students in Education are like mom's – they are there doing the work but are often invisible. Women doctoral students, despite consisting of the majority in the classroom, did not make the same attempts to make themselves known to the faculty, male or female –the women thought their written work would speak for itself.

Alicia says that although women doctoral students expect for the Education environment to be supportive, she never expected the Education environment to be supportive. Upon beginning the doctoral program, Alicia didn't expect NUES, or any other doctoral program, to provide a supportive environment for doctoral students because she believes doctoral education is a privilege – she feels privileged to be a doctoral student and as a privilege, she must take responsibility for her own education and success. Alicia didn't expect NUES to support her during her program, although she said receiving support "would be nice," like icing on a cake. Alicia plans to complete her degree by 2015, and perhaps earlier. Alicia does not know what her career path will be once she completes the doctorate, and she is perfectly okay with the uncertainty. She knows she does not want to pursue a career in the professoriate nor return to the classroom as a teacher because of the politics.

Nicole – The Aspiring Fine Arts Dean (6th year student, Dissertation Proposal Phase)

Motivation for and impressions of doctoral study. Nicole is a Black woman in her late thirties and is currently a sixth-year doctoral student studying Higher Education at NUES. Nicole grew up in the Northeast and attended a public high school. Nicole has always had a love of theater and the arts, and so she attended a private university in the Northeast and she majored in Theater. Originally, Nicole thought she would move to New York City to become an actress but she had student loans to pay and so she decided to work full-time for a consulting firm and user her Theatre background to coach executives. She had discovered a field within theater in which she could perform research. Nicole wasn't sure of what to do next, so she figured she would apply to

graduate school. She applied to MFA programs in Theatre and eventually enrolled in an MFA program at an Ivy League university.

After earning her MFA, she worked as an office assistant and then she was hired as a Director of Academic Support Services at a theater school. Nicole saw what her boss was doing as the Dean of the theater school, and that's when she decided to pursue a career in the academic theater world. Nicole figured that since she already had a terminal degree in theater, she might as well earn the terminal degree in Education administration. Nicole ultimately decided to attend NUES because of the full tuition stipend guaranteed for three years. Upon arriving at Northeast University, Nicole remembers that her orientation was very intense and that the faculty and staff were appreciative and excited for the arrival of the new doctoral students. However, once classes began, Nicole remembers feeling "stupid" during her first year because it was the first time she took research methods classes.

Doctoral student experiences. Nicole is beginning her sixth year in the doctoral program at NUES in the Higher Education concentration. She has a part-time administrative job at one of the schools at Northeast University about 17 hours per week and she also served as a teaching assistant (TA) for three courses last semester. Overall, Nicole works approximately 40 hours per week if not more, while simultaneously working on her dissertation proposal because her boyfriend lost his job this past semester, and she felt she needed to work more to contribute to the household. In order to pay for the cost of living, Nicole has taken out loans every year in her doctoral program. Nicole does not believe that the NUES doctoral program provides an adequate level of funding to afford the cost of living in the area.

Nicole has had the same female advisor throughout the last five years in the NUES doctoral program. Nicole described her relationship with her advisor as pretty good because her advisor provides both academic and emotional support. Nicole likes that her advisor is a professor of practice who is active in the Higher Education profession. Nicole is satisfied with the quality of the advising relationship, and Nicole believes her advisor has had a positive influence on her doctoral experience particularly because of the emotional support she provides Nicole. Nicole's advisor is very clear with Nicole about her expectations for Nicole's degree progress and provides Nicole the structure she needs to finish the doctoral degree. Nicole perceives NUES's culture to be one in which students must be proactive to seek out the diversity of educational opportunities available. Nicole perceives that NUES discourages conformity; instead, doctoral students are told they can study whatever they want both at NUES and in other schools within Northeast University. Nicole does not believe that NUES lives out its mission of being at the nexus of policy, practice, and research because of the new PhD program that will begin next year, thus further separating the division between research and practice. Nicole says there is a culture of competition among the doctoral students to finish the degree. However, this competition is covert – nobody talks about it.

Degree progress and the gendered environment. Nicole mentioned that her doctoral student peers, in particular more advanced doctoral students, have been a great resource for facilitating her doctoral degree progress because they sympathized with Nicole's experiences and normalized her feelings of inadequacy during the first year. Nicole said that her advisor and her dissertation committee have been particularly helpful for her degree progress. Nicole perceived the required research methods classes as

helpful for improving her research skills, in particular the quantitative methods. Nicole likes the flexible structure of the doctoral program in theory but in practice it was not helpful for her degree progress because there were not enough courses in Higher Education available to take. Nicole says she struggles with continuing to remain motivated and overcome her perfectionism.

Nicole perceives that gender is important in the fact that as a woman, she has multiple hang-ups about her degree progress. Nicole does not think that men have these same hang-ups because men are more confident in their decisions. Her perception is that men approach their doctoral work just like any other job and she perceives that mentality to be beneficial for timely degree progress. Nicole admits to instances where she has second-guessed herself and she has wondered form time to time if she was an "admissions mistake" and she perceives that women are more likely to think these thoughts. Nicole believes that women faculty members can be harder on women doctoral students than male doctoral students because women push fellow women to be better and overcome gendered stereotypes. There was one instance in Nicole's doctoral experience where she was aware that being a woman, and more specifically a Black woman, mattered. Nicole had a male professor who discouraged her from asking questions in class by putting is hand over her mouth after she had asked a series of questions about the course content. After the incident, she had a number of faculty and fellow doctoral students approach her validating her feelings and offering support. Eventually the professor apologized to Nicole, but Nicole does not think this professor would have put his hand over the mouth of a male doctoral student, or a White woman.

Nicole's degree progress has been continuous throughout her five, going on six years at NUES. However, in her second year, she suffered from depression and she had to withdraw from some of her classes, and so she had to take more classes in her third year to catch up. Nicole anticipates she will complete her dissertation in Spring 2014 at the latest. Nicole wants to publish her dissertation as a guide for leaders in fine arts schools because her ultimate career goal is to work as a senior-level academic administrator at a Fine Arts college or university

Elizabeth – A Communications Educator (7th year Student, Dissertation Phase – Data Collection)

Motivation for and impressions of doctoral study. Elizabeth is a White woman in her late thirties and is a seventh-year student studying Community and Diversity Education at NUES. Elizabeth was born in New York but moved around for much of her childhood before attending a private university in the Mid-West. While in college Elizabeth studied Theatre and developed her interest in Communication. After graduating, Elizabeth worked in children's television for eight years and became friendly with many of the educational consultants and volunteers who did the research for the educational shows on the networks. Elizabeth was encouraged by her professional colleagues to pursue a Master's degree which combined Communication and Education in New York. After taking two classes in the Master's program in New York, Elizabeth realized that the program was not for her. Thus, she began looking for a different Master's program in which she could study both Communications and Education. Elizabeth applied to NUES because she knew that having a degree from NUES would help her get a great consulting job. During the fall semester of her Master's degree at

NUES Elizabeth applied for the doctoral program there after one of her professors encouraged her to apply. Elizabeth's first impression of NUES was it was improving from when she was a Master's student because of the new dean. Elizabeth said the doctoral program wasn't structured in a way that was helpful. The five doctoral program sub-specialties do not have any strongly differentiated requirements. Elizabeth said she found her fellow peers to be very collegial and felt a strong sense of community among the 40 or so doctoral students in the cohort.

Doctoral student experiences. During the first couple years, Elizabeth spent about six to eight hours each day, attending classes, studying for classes, and serving as a teaching assistant (TA) for a course each semester. Then in her second and third years in the doctoral program she worked over at a neighboring institution in research administration about 30 hours per week while she finished her coursework. Then, after having her daughter in her fourth year of the program, Elizabeth stays home with her 2-year old daughter in the mornings while her husband is at work and then in the afternoon she comes to NUES to work on her dissertation proposal or prepare for courses she is teaching. Elizabeth received full funding to cover the cost of her tuition for her first five years in the doctoral program, and she received a scholarship from Northeast University to cover her tuition in her sixth year when NUES no longer covers tuition. Elizabeth received a small fellowship her first year like all doctoral students get and also worked as a research assistant to help pay the rest of her living expenses before she married her husband. The fifth and sixth years Elizabeth has worked as a TA at NUES for master's level classes. Regardless of these jobs, Elizabeth said she had to take out loans each year in her doctoral program to be able to afford the cost of living. Elizabeth does not think

that her doctoral program provides adequate funding for cost of living in the Northeast area.

Elizabeth has had the same female advisor throughout the last six years at NUES as a doctoral student, and she actually met her advisor as a master's student when she worked as an RA. Elizabeth thought her relationship with her advisor was pretty amicable, but when Elizabeth told her advisor at the end of her first year in the program that she planned to get married during her second year, her advisor suggested that she postpone marriage (and eventually having children) because it will slow down her degree progress. Elizabeth was shocked by this and even considered switching advisors, but decided to stay with her advisor because her advisor's research interests and her way of thinking was the best fit for Elizabeth's dissertation work. Overall, Elizabeth says she would be happier with her advisor if her advisor could take her to conferences and help her network with key people in the field since Elizabeth's goal is to become an academic. Elizabeth says that her advisor has not impeded her degree progress. Elizabeth perceives the NUES culture to be isolated from the rest of Northeast University and in constant flux from year to year. The Dean has played a significant role in making NUES a warmer and more inviting environment by making changes to the physical space and also increasing the funding packages for doctoral students to cover tuition for five years. The doctoral program does not emphasize the application of research to the classroom and communicating that research with educators so they can implement it. Instead, the faculty stress the importance of publishing in peer-reviewed research journals rather than in journals that practitioners, such as teachers, read.

Degree progress and the gendered environment. Elizabeth believes that the classes and the faculty's focus on teaching have been particularly helpful for her degree progress. Elizabeth also talked about her doctoral peers as being the real asset to the program. She also thinks the doctoral program guide is really clear cut and is helpful for navigating the doctoral experience, she likes that she doesn't have to orally defend her dissertation after the final document is approved by her committee. Elizabeth thinks that the order of methods classes, in particular the methods courses occurring at the beginning of the program, is a real obstacle to many students' degree progress. Also, Elizabeth believes that her personal life and the choices she had made to be more present in her daughter's life as a mother has been a challenge to her degree progress because she has not been present on campus. Elizabeth believes that many of the challenges of being a doctoral student and a parent is more challenging for women. The male doctoral students who had children early on have finished their doctoral degrees because their wives were able to take care of the children. The positive is that being a doctoral student allowed Elizabeth to have a flexible schedule in which she can stay home and take care of her daughter.

Elizabeth believes that her doctoral program is supportive of women but that it could provide more support, in particular subsidized childcare, on campus for doctoral students who have young children. Currently Elizabeth is going into her seventh year in her doctoral program and she is collecting and analyzing her data over the next and last year. She hopes to be finished by the middle of the Spring 2013 semester. Of the 40 students in her cohort, 26 of them are still working on their dissertation going into year seven. Once Elizabeth completes her degree, her plan is to go on the academic job market

in the Fall, apply for post-doc positions in the Winter, and also apply for industry positions in the early Spring to see what pans out. Elizabeth's first choice is to land a full-time tenure-track faculty position because she likes the flexibility of the academic life. However, she questions whether she wants to work at a research university versus a teaching university because she dislikes the constant pressures to acquire funding to publish at research universities and instead prefers teaching.

Karen – Disenchanted with the Doctoral Degree (8th year Student, Dissertation Writing and Editing Phase)

Motivation for and impressions of doctoral study. Karen is a White woman in her forties and a seventh-year doctoral student studying Higher Education at NUES. Karen was born and grew up in the state of New York during her schooling years. Karen attended a private university and majored in English. While in college Karen served as a resident assistant, worked on the student newspaper, student government, and in the career development office: these experiences fueled her interest in student affairs and higher education administration. Karen attended a public university in the mid-West for her Master's degrees in College Student Personnel and Guidance and Counseling, which she earned concurrently in 2.5 years. After graduating, Karen worked for a year as a Development Associate on the West Coast and then worked at a nearby private university for 10 years in student affairs where she eventually became Assistant Dean of Students.

Karen was encouraged by her superiors to pursue a doctorate because in the academy having a doctorate was an expectation in order to assume either faculty or senior administrator roles. Ultimately, Karen chose NUES because of the flexibility to study what she wanted and the availability of support networks. The support network was

particularly important considering she would be leaving her husband and home behind on the West Coast to attend NUES. Karen's first impression of Northeast University was that it was an institution of prestige and power and the intellectual center of the universe, but still an institution with imperfections. Karen said NUES is a place where one must take responsibility and be proactive about one's own success. However, Karen perceived a lack of community within the doctoral cohorts and between NUES and the other graduate schools. Karen's first impression of her doctoral program was that it wasn't well-organized, and sometimes she couldn't help but think she was the "admissions mistake."

Doctoral student experiences. At the time of the interviews, Karen had finished her seventh year as a doctoral student and was writing and editing the final chapters of her dissertation. She accepted a full-time job in institutional advancement and works on her dissertation-related writing on the commute to and from work and during lunch. On weeknights and weekends, she spends time with her husband and on her other hobbies. Karen received full funding in the form of tuition to attend NUES during her first year, but her tuition was not covered her second year and she was able to pay her tuition and living expenses by working as a TA and an RA every semester she was in residence at NUES in addition to taking out loans that year. When Karen began her third year in the doctoral program, NUES began guaranteeing full coverage of tuition for up to five years, so Karen's tuition was covered for years three through five. Karen had a RAship in which she worked 20 or 30 hours per week and also served as a TA for multiple classes for four years. Karen said there is always money to be made if doctoral students are willing to

work for it, so she perceives that the compensation from her multiple TA and RA jobs was adequate to afford to live in the Northeast.

Karen has had two different faculty advisors throughout her doctoral program. She originally was assigned a female advisor in the Educational Policy and Leadership track so she could concentrate her study in Higher Education but Karen switched to a female advisor who specialized in the Human Development track because of her dissertation research topic. Karen said the transition was easy and her former advisor was supportive. Karen describes her current female advisor, who is also her dissertation chair, as a person who treats her as a "colleague in the making" and she is perfectly satisfied with the quality of the relationship, although she recently found out that her advisor will be unexpectedly going on leave in the Fall and will not be available to provide feedback. Karen is weary about how this will affect her degree completion. When asked about the culture of NUES, she could not pinpoint an overarching ethos to describe NUES as a whole. However, she described her doctoral program culture, in particular the peer culture, as collegial and the general attitude was similar to martyrs – there was a competition amongst her peers of who was working the hardest and taking on the most jobs. Karen also mentioned that doctoral students made little effort to build community, although she was lucky enough to find peers who provided academic and emotional support.

Degree progress and the gendered environment. The flexible structure of the doctoral program and autonomy Karen has had throughout her doctoral study has been helpful for Karen's degree progress. She also points to her peers as an important source of support because of the commonalities they shared in their values. The NUES faculty

and staff that Karen interacted with were receptive to students' needs and this also facilitated Karen's degree progress. The biggest obstacle for Karen has been the misalignment between NUES's values, the doctoral program's values within human development and higher education, and her own values. The lack of student-centeredness of NUES and its vision for higher education in the world did not fit with Karen's vision.

Karen says she has always been sensitive to gender-based differences in interpersonal communication, and when asked if there were any times when she thought being a woman particularly mattered, she did notice two things. Karen believes that the NUES faculty treated women and men equally in class, but she did notice that the male doctoral students in the class were more willing to share their ideas with the professor than the female doctoral students who represented the majority. Also, Karen did recall a time when one of her committee members, a male faculty member, gave her advice as if she was his daughter. She challenges the commonly held assumption that female-dominated fields are more supportive of women than male-dominated fields and believes the doctoral environment is different for every individual.

Rachel – The Competitive Overachiever and Workaholic (6th year Student, Completed Dissertation in Spring 2012)

Motivation for and impressions of doctoral study. Rachel is a White woman in her mid-thirties and completed her dissertation within six years at NUES. Rachel graduated with her doctoral degree in Educational Policy and Leadership in June 2012. Rachel grew up in New York City where she attended an elite private high school with a competitive environment that fed the competitive part of her personality. Rachel developed her interest in teaching and education during high school where she tutored

other students on the weekends. Rachel ultimately attended a selective liberal arts college in the Northeast and majored in American Studies. As a college student, she taught at a local high school during the year and worked for the superintendent of the New York City public school district during one summer. She loved teaching and so after graduating from college, Rachel got a job teaching history at a private k-12 school in Los Angeles. After teaching for two years, Rachel decided to apply for master's programs in Education because she always knew that her future career path involved school leadership and administration. Rachel applied for Master's programs in Education on the East Coast because she grew up there. Rachel chose NUES because of the educational prestige and opportunities she would have there. Rachel said she had a horrible experience as a Master's student at NUES because she had a hard time connecting with her peers.

After graduating from the Master's program at NUES, Rachel accepted a job working as a senior research associate in Los Angeles. After working there for two years, Rachel decided to go back for her doctorate because she was growing more dissatisfied with her work, and the women she saw in positions of power to effect change had doctorates. Rachel decided to attend NUES mainly because it was familiar. Rachel's impressions of the NUES doctoral program were completely different than her impressions as a Master's student. She perceived the doctoral program to be more intimate and collegial than her master's experience, and yet she described the general NUES departmental culture as competitive and hierarchal which was reflected in faculty politics.

Doctoral student experiences. The pressure and stress Rachel felt to be the best among her high-achieving, type-A personality doctoral peers caused her to lose 25

pounds during her first semester as a doctoral student. Rachel has 1-year old twin boys, and before they were born during her fifth year of doctoral study, she would treat her doctoral work as a full-time job: she would do work for her own research, conduct research with her advisor, or serve as a teaching assistant (TA). Rachel served as TA for 16 courses in five years. She did it partly for the money (she received $5,000 per course) but also because she loves to teach and stay connected to the NUES student community. She also served as a research assistant (RA) for three projects and did consulting work. At any one time Rachel held between six and seven jobs and would work 80- 100 hours per week during busy times. Rachel won a fellowship from Northeast University which provided her with full tuition and a stipend of $5,000 per year for three years when she began before the funding structure changed to its current form. Rachel has a husband who works full-time and she comes from a wealthy family who paid for the full-time nanny that helps take care of her twins during the week while she worked on her dissertation. Rachel does not believe that her doctoral program provides adequate funding for single doctoral students to live in the area.

Rachel had had two different advisors during her six years at NUES. Rachel was assigned a male advisor during her first year who was very famous but was not available to be a mentor and provide support. It took Rachel four years to switch to her current female advisor with whom she was doing research and teaching courses for about three years because she was waiting for her current advisor to receive tenure. Rachel says her current advisor treats her as a true colleague, and she is extremely satisfied with their advising relationship. Rachel's advisor played a vital role in making her doctoral experience positive and helping her finish the degree in six years. Rachel also talked

about the importance of another statistics professor whom she taught for who was pivotal in her doctoral development because he believed in her work. NUES's doctoral culture is more focused on training policy makers and formal sources of leadership. Rachel says NUES emphasizes conformity. In order to be successful, doctoral students are expected to conform to the competitive culture of the doctoral program, follow the rules and the hierarchies of power, work hard doing research and teaching, and do what they are told by the faculty without asking questions or demanding support. However, Rachel has been quite successful by not conforming to what is expected of NUES doctoral students. She often challenged current educational paradigms in her classes and demanded support from her advisors and other faculty. However, Rachel says she has been successful in this culture because she produces research publications under the direction of her advisor/dissertation chair.

Degree progress and the gendered environment. Rachel says that having a close knit group of peers to rely on was a critical factor for facilitating her degree progress. Rachel's degree progress gained momentum at the beginning of her fourth year when she switched to her new advisor and formed her dissertation committee. Nevertheless, Rachel believes that she was lucky to have found great peers and professors to work with, as this is not something that is typical at NUES. Rachel's RA and TA positions have been helpful, not just in terms of the financial support but also the opportunities these positions have created for adding publications and teaching experience to her CV. Rachel also attributes her degree completion to her personal work ethic, productivity, and efficiency. Rachel said that the Doctoral Degree Review Committee that reviews dissertation proposals was a hurdle that challenged her degree

progress in addition to the qualifying paper (QP), which took her four years to complete because she was struggling with her research topic. Rachel also said that the competitive environment at NUES for doctoral students was not conducive to her degree progress because it caused unnecessary stress.

Rachel talked about the very much gendered "daddy and the girls" environment of K-12 (and college) leadership in which women make up the majority of the workforce of teachers who are led by male principals and superintendents at the top. She says that her doctoral program in Educational Leadership and Policy is preparing doctoral women to enter a male-dominated environment in positions of educational power, and so even though she has not experienced gender discrimination as a doctoral student, she anticipates that she may experience gender-related challenges in her approach and implementation of school leadership and instruction which might be different than that of her male counterparts. Rachel has lined up a post-doctorate with her advisor for next year and will also do consulting work while she is contemplating about whether to apply for faculty positions for the following year in Educational Leadership.

Brenda – The Seventh Year Veteran (7th year student, Dissertation Phase – Data Analysis)

Motivation for and impressions of doctoral study. Brenda is a forty something White woman and is beginning her seventh year in the doctoral program in Human Development at NUES. Brenda grew up in New York City and attended a boarding school for high school. Brenda decided to attend the same Ivy League institution as her father and studied Psychology. Brenda's first exposure to Education was during the summer after sophomore year in college when she did research with a professor who was

interested in both psychology and Education. After graduating college Brenda worked as a legal assistant at a law firm for 10 months so she could figure out whether she really wanted to pursue a career in Law or Education. Brenda decided to earn a Master's degree in Education where she specialized in Early Childhood Education. The student teaching opportunity eventually led to a full-time job as an assistant teacher for elementary education and eventually a 10-year career as a teacher. Brenda really enjoyed teaching but she was growing dissatisfied with the flatness of the teaching profession and intellectually she wanted more so she applied to doctoral programs with good reputations in the sub-field of Child Development. Ultimately, Brenda decided to attend NUES mostly because of the financial package she received – her scholarship covered full tuition and a stipend each year throughout her doctoral program. Brenda's first impression of the NUES was that the school was incredibly supportive and encouraging of the first year doctoral students to form bonds with one another. During her first year, Brenda said she felt distant from many of her peers because of her responsibilities to her husband and as a mother of a young son.

Doctoral student experiences. Brenda is currently beginning her seventh year in her doctoral program with a specialization in Human Development. Brenda works full-time in a lab on research about child development. While in the Human Development research lab, she works on her own dissertation research and is paid an hourly wage. During the earlier years of her doctoral program, she served as a teaching assistant (TA) for a few classes for which she was paid a $4,500 stipend. Brenda believes that NUES's financial package is getting better with each year. She definitely was impressed by the scholarship she received from Northeast University which provides her with a stipend

each year in addition to the full tuition funding package that all doctoral students receive for five years. During her sixth year, Brenda had to pay for one credit of doctoral continuation tuition since she is beyond the five-year limit. Brenda also used some savings and money from her parents to help with the cost of childcare and other living expenses. Brenda does not believe they are adequate to cover the cost of living in the Northeast.

Brenda was assigned a female faculty advisor during her first year at NUES, but this advisor did not make an effort to get to know Brenda. Brenda's advisor was not granted tenure and eventually left Northeast University, and Brenda asked the primary investigator (PI) on the research project she was working on to be her advisor. For the most part Brenda's advisor/PI has been supportive of her work at the center, but when she approached her advisor to discuss her dissertation work, this was the first time in four years that he did not support Brenda's dissertation research idea. Thus, Brenda had to change her research topic. Overall, Brenda is satisfied with the quality of the relationship with her advisor because she has changed her expectations of the relationship in terms of how often she expects her advisor to meet with her, his timeliness in providing her feedback on her dissertation, and his overall commitment to her professional and personal success. Brenda believes her advisor gives her the appropriate amount of attention given that she does not plan to pursue an academic career. Brenda perceives the doctoral peer culture to be one that is both competitive and yet supportive of doctoral students who want to work as teachers. Brenda perceived the NUES faculty to be too busy for doctoral students due to the competing demands of conducting research, finding funding, and

publishing. Brenda says the values of academia often don't coincide with what's going on in the practical world of educating children.

Degree progress and the gendered environment. Brenda just submitted her dissertation proposal to the committee that reviews dissertation proposals and is now beginning the data analysis of the data she already collected for her dissertation. Brenda said she likes that the NUES degree program was ambiguous and integrated the research, practice, and leadership components of Education. However, she says that this flexible structure also challenged her degree progress. Brenda said she wishes she received more directive guidance in the earlier stages of her program. Brenda says she struggled with deciding on a qualifying paper and a dissertation topic.

Brenda says that there are differing expectations for men and women doctoral students, and that she believes the expectations are more strict for men. Because there were only five or six men in her cohort of 50 doctoral students, Brenda said it was the male doctoral students that "stuck out." The piece that differentiates the doctoral experience of women from that of men is the childbirth and childrearing responsibilities. She perceives that having children can definitely slow women's degree progress but she does not believe this gendered difference is institutionalized within the NUES doctoral program – it is more a product of societal and biological constraints.

Overall, Brenda does not perceive being a woman to have personally affected her doctoral experience and degree progress. Nevertheless, she does perceive that NUES provides a somewhat supportive environment for women, but does so in more informal ways rather than formal structures. Women can get the support they need but it is often through informal relationships with peers and networks that the women proactively seek

out rather than from formal structures like the faculty advisor or coursework dedicated to helping students navigate through their doctoral program. In general, Brenda does not believe academia in general is supportive of the various roles that women must juggle in their everyday lives. Brenda is hoping she can finish her degree by the end of next year, her seventh year in the doctoral program although a more realistic goal is to finish by Fall 2014. Brenda is uncertain about her future career after the doctoral degree, which is part of the problem she says, because if she had a clear sense of her career goals, it would be easier to figure out how to get there. Brenda plans to apply for jobs in which she can use research to impact practice directly in the classroom.

Summary

In sum, the 10 Education women at NUES have both similar and different motivations for pursuing the doctoral degree, doctoral experiences, and identified different supports and challenges to their degree progress. Overall, the Education women have not had very positive doctoral experiences, because of inadequate funding, inconsistent relationships with their faculty advisors, and a relatively isolating doctoral department and program environment. In the next chapter (Chapter Five), I profile the 11 Engineering women I interviewed at the Northeast Institute Engineering School (NIES), whose doctoral experiences and degree progress were somewhat different from those of the NUES Education women.

CHAPTER FIVE: ENGINEERING DOCTORAL WOMEN PROFILES

A total of 11 Engineering doctoral women enrolled at the Northeast Institute Engineering School (NIES) participated in the study, and each had a unique story to tell about her own motivation to pursue doctoral study in Engineering, and more specifically at NIES, her doctoral experiences while at NIES, and the supports and challenges to degree progress she experienced as a woman in the male-dominated Engineering field. What follows are the stories of 11 Engineering doctoral women, told in ascending order, starting with women in the earlier phases of their doctoral program and ending with women who have recently completed their degree. The last story is of one woman who is still working on her degree after six years.

Engineering Doctoral Women Profiles

Katherine and Sally are second-year doctoral students – Katherine is still in the coursework phase in the Computer Systems and Biological Engineering program, and Sally has passed her qualifying examination and is working on her dissertation proposal in Environmental Engineering. Heather is a third-year student who was working on her dissertation proposal in Aero-space Engineering. Three of the 11 women are all in the dissertation phase of their doctoral program, either collecting or analyzing the data or writing up the written document for their dissertation, otherwise known in the Engineering field as the doctoral thesis. Maureen is a third-year doctoral student in Chemical Engineering who is now working on her thesis data collection. Danielle is a fourth-year student in Geo-technical Environmental Engineering also in the doctoral thesis data collection phase. Elaine is a fifth-year doctoral student working through her doctoral thesis data collection in Material Science and Engineering. The next four women

have all completed their doctoral theses and graduated with their degrees in the last six months. Amie completed her PhD in Material Science and Engineering in five years in Fall 2012; Madelyn completed her PhD in Aerospace Engineering in August 2012 after five years; Sara completed her doctoral thesis and graduated with a PhD in Civil Engineering in June 2012 also after five years (masters plus doctoral phases); and finally Whitney completed her PhD in Environmental Engineering within seven years in June 2012. The last woman profiled is Susan, a sixth-year veteran doctoral student in the Aeronautics and Astronautics department who is still working on her doctoral thesis proposal. A table summarizing the demographic characteristics of the 11 Engineering doctoral women at NIES is below.

Table 3: Demographic Characteristics of Engineering Doctoral Women

Name	Sub-Specialty	Doctoral Program Phase	Citizenship	Race/ Ethnicity	Age	Marital Status	Children
Katherine	Biological Engineering	2nd year, Coursework	U.S. Citizen	White	21-25	Single	None
Sally	Environmental Engineering	2nd year, Dissertation Proposal	U.S. Citizen	White	21-25	Single	None
Heather	Aeronautics/ Astronautics Engineering	3rd year, Dissertation Proposal	International (England)	Indian	21-25	Cohabiting	None
Maureen	Chemical Engineering	3rd year, Dissertation Data Collection	U.S. Citizen	White	26-30	Single	None
Danielle	Environmental Engineering (Geotechnical)	4th year, Dissertation Data Collection	International (Canada)	White	26-30	Single	None
Elaine	Material Science Engineering	5th year, Dissertation Data Collection	U.S. Citizen	White	21-25	Single	None
Amie	Material Science Engineering	5th year, Dissertation Complete	International Student (France)	White	26-30	Cohabiting	None
Madelyn	Aeronautics/ Astronautics Engineering	5th year, Dissertation Complete	U.S. Citizen	Asian/ Asian American	26-30	Married	None
Sara	Civil Engineering	5th year, Dissertation Complete	U.S. Citizen	Middle Eastern	31-35	Single	None
Whitney	Environmental Engineering	7th year, Dissertation Complete	U.S. Citizen	White	31-35	Married	None
Susan	Aeronautics/ Astronautics Engineering	6th year, Dissertation Proposal	U.S. Citizen	Multi-racial	26-30	Single	None

Katherine, The Caretaker (2nd Year Doctoral Student, Coursework and Qualifying Exams)

Motivation for and impressions of doctoral study. Katherine is a White woman in her early twenties and is a second-year doctoral student studying Computational Systems and Biological Engineering (CSB) which is an interdisciplinary doctoral program housed within both the Biological Engineering and Computer Science Engineering departments at NIES. Katherine grew up in South Carolina and attended a free public boarding school known for excellence in math and science. After participating in a computational systems summer research project at a local state university, she knew she wanted to become a scientist and work with computational systems in either physics or biology. Katherine attended an Ivy League institution and decided to major in Engineering because the major offered the most math and computer science courses. Katherine knew in high school that in order to become a research scientist, she had to go to graduate school and earn a PhD, and so her plan all along was to attend graduate school immediately after college. As a senior in college, Katherine applied to doctoral programs with a focus in quantitative biology including bio-engineering, computational biology and systems biology. Katherine was originally waitlisted at NIES but ultimately was admitted. She decided to attend NIES because the graduate school had the exact program she was looking for. Katherine's first impression of Northeast Institute was that the culture was a lot less stuffy than her undergraduate school. She remembers feeling intimidated by the professors and some of the doctoral peers who had more of a biology background than she did, but also remembers how helpful both were in her transition

during her first year. She also noticed that there were very few women in her CSB doctoral cohort.

Doctoral student experiences. Katherine is in the coursework phase of her doctoral program. Katherine took three classes each semester and spent most of her days either in the rotation lab, or working on problem sets that were due. NIES completely funds the cost of her doctoral education through a research assistantship. During her first year, Katherine received a fellowship from the department while she rotated labs with various professors for the first couple months to figure out which project and primary investigator (PI) she will work with throughout her doctoral career. Starting in her second year, she is funded by the PI in her lab through a grant. The grant pays Katherine's tuition, health insurance, and an annual stipend of $31,000. In addition, Katherine must financially support her mother who lives with her, so Katherine works on-campus part-time for about 6 hours per week providing information technology support to faculty, students and staff at NIES's computer center. If Katherine didn't have to also financially support her mother, she says that the funding that NIES provides is adequate to cover the cost of living in the Northeast for just herself. Katherine has not had to take out loans to pay for her doctoral education.

Katherine's PI in her lab has served as her advisor for the past two years. Katherine's advisor is a young male professor in the CSB department, and really likes that her advisor encourages her to solve data problems and ask questions. Katherine says her advisor makes her feel like a contributing member of the research lab. Overall, Katherine says she is satisfied with her relationship with her advisor thus far. Katherine describes the culture of her department as nerdy and specialized. Doctoral students are

taught to question data and the focus is on generating questions and ideas. She describes the doctoral program as interdisciplinary because her CSB is split among three different departments – Computer Science and Electrical engineering, Bio-Engineering, and the Biology department in Arts & Sciences.

Degree progress and the gendered environment. Katherine's degree progress has been steady throughout her first two years in the CSB doctoral program. She says that her peers in the program and her boyfriend have helped her keep going in the doctoral program. She said the program administrator has been incredibly helpful to the students within the department. Katherine also said engaging in stress-relieving activities such as reading or watching movies or television has helped her recharge, and she believes her personal motivation and desire to earn her PhD is what internally keeps her moving forward. Katherine also says the fact she can bounce ideas off her advisor helps her move forward in her thesis research. Katherine says it is difficult to become motivated again after finishing a big project because she knows that the workload is going to get heavy again. Also, Katherine says she does not have enough free time and that makes her feel burnt out and is a challenge to her degree progress.

Katherine does not believe that her Engineering doctoral program is supportive of men or women because by design, doctoral programs in Engineering are supposed to weed out those who can't handle the pressure in both academia and industry. Katherine says that most of the gender discrimination that goes on is external to NIES. Society in general has made comments about women's lack of inherent ability in math and science and that angers Katherine. Katherine believes that there is added pressure for women studying the STEM fields because if these external sources are telling women that it's

weird for a woman to study STEM and doctoral programs are not designed to be supportive, the combination of the two factors can make women, including herself, start to doubt themselves. Moving forward, Katherine anticipates enrolling in her last required courses and is contemplating whether she should complete a master's degree in Computational Design along the way to earning her PhD. Katherine hopes to finish her doctoral program in either five or six years and graduate in 2016 or 2017. After completing the PhD, Katherine's career plan is to apply for post-doc positions in research because she eventually wants to become a professor.

Sally, The Transfer Student (2rd Year Student, Coursework and Thesis Proposal)

Motivation for and impressions of doctoral study. Sally is a White woman in her early twenties and a second-year doctoral student studying Environmental Engineering at NIES. Sally was born in Belgium and moved to the United States when she was 12 years old. She first became interested in science after her father gave her a book to read by a famous physicist. Sally participated in many science-related extracurricular activities during high school and applied to colleges wanting to major in physics. Sally decided to go to NIES because she wanted to attend the best school she could get into and that at NIES she would be surrounded by other students equally passionate about science. Sally made the decision to focus her studies in Environmental Engineering because she loved the utilitarian aims and she had become disenchanted with studying physics. Sally became interested in graduate school through her Engineering professors she did research with at NIES. Sally applied to doctoral programs at institutions where there were faculty doing research in her sub-field of Hydrology within Environmental Engineering. Sally decided to enroll in a PhD program in Environmental

Science and Engineering at a university in the Southeast because she wanted to gain a different perspective at another institution with a professor whose research interests matched her own. During her first year in the PhD program, Sally she found her environmental science lab socially isolating. Because her professor had the dual appointment in two departments, Sally didn't feel like she could connect with other PhD students in either department. She also missed the hand-on research she had been doing at NIES. Sally ultimately transferred back to NIES after just one semester to work in the lab with her undergraduate research advisor. Sally's initial impressions of the Environmental Engineering department at NIES were that it more social and collegial and the NIES department highly encouraged students from different research labs to share ideas.

Doctoral student experiences. As a second-year doctoral student, Sally recently passed her qualifying exams and is finishing up coursework. She has also begun her doctoral thesis proposal. She is currently the only woman doctoral student in her research lab. This past semester she took two classes, so she would attend class and work in the lab about 40 hours per week. Sally has an NSF graduate student fellowship which pays for half of the cost of her tuition and a $30,000 per year stipend, including during the summer. The rest of her tuition is paid through NIES as part of Sally's RA appointment. She has never heard of any doctoral student who not received financial support throughout their PhD career. Sally does not use any personal resources such as loans to fund the cost of living. However, her parents do give her $200 per month because they were unhappy with the conditions of the NIES apartments that she could afford. Nevertheless, Sally believes the funding package she receives is adequate to live in the

area. Sally's lab recently acquired a NASA grant which will fund her tuition and stipend for her third and subsequent years in the doctoral program.

Sally's advisor is a male full professor at NIES, and as the head of a NASA satellite mission and the Environmental Engineering sub-department he is a pretty busy guy. Overall, Sally says her satisfaction with the relationship she has with her advisor fluctuates depending upon the week. She is satisfied with the quality of the advice he gives her and his professional connections both within the department and in the field of Environmental Engineering; however, she would like her advisor to be more available and responsive. Sally perceives the culture within Environmental Engineering department as innovative and collaborative. Also, the departmental culture seems to belief in applied value of science for solving real-world problems.

Degree progress and the gendered environment. Despite having transferred from another doctoral program after her first semester, Sally's degree progress has been continuous. Sally said the peer support and the collegial nature and structure of the lab she has received have been helpful for her degree progress because the environment is conducive for encouraging interaction. Sally said that the advisor is the most important factor that affects the quality of the doctoral experience. Sally struggled with working on a project that was assigned to her and the inability to explore other areas within Environmental Engineering.

Sally said she has struggled to remain confident in her abilities, and she often hesitates to assert herself as a doctoral student while in meetings with clients or her professors. However, she thinks it has less to do with being a woman in a male-dominated field and more to do with the way women are socialized in American society.

She mentioned her lack of confidence may have to do with cultural differences between Belgium and the United States in how confidence is expressed. Sally plans to complete the PhD in 2015 or 2016, and once she completes her degree, Sally hasn't quite decided what her future career will be. She knows that she enjoys doing research, but she unsure about whether she will work in academia or a nationally-funded research center.

Heather, The Next NASA Engineer (3rd Year Student, Ending Coursework and Thesis/Dissertation Proposal Phase)

Motivation for and impressions of doctoral study. Heather is an Indian woman in her mid-twenties and a third-year doctoral student studying Space Systems Engineering in the Aeronautic and Astronautic Engineering department at NIES. Heather was born in Canada and moved to England with her family for high school. Heather was debating between applying for Engineering or Education programs for university, and when her career advisor questioned her interest in Engineering since he said it was a field for boys, Heather decided to study Engineering to prove him wrong. Heather attended Cambridge University in England to study Engineering, and during her third year she attended NIES as part of an exchange program to study Aerospace and Aero-thermal Engineering. After her experience at NIES, Heather returned to Cambridge to complete her Master's degree in Astronautics Engineering, because Engineers must have their master's degree to practice in England. Heather decided to pursue a PhD immediately after her master's because having a PhD was necessary to work in the U.S. as a non-citizen. Heather decided to return to NIES because the Aero-Astro program had an excellent reputation and she was going to work for the same advisor she had as an undergraduate. Heather's first impression of the graduate student culture was that it was

relaxed and there were many graduate students enrolled. She remembers feeling frustrated about having to take additional coursework at NIES as a doctoral student even though she already earned a master's.

Doctoral student experiences. As a third-year doctoral student, Heather is currently conducting research for her thesis and has a couple courses left to complete. She spends about 10 hours each day either in class or working in the lab. For her first year of doctoral study at NIES, Heather received one of five NIES fellowships for incoming graduate women studying Engineering which paid for her tuition, fees, health insurance, and a monthly stipend. Currently, Heather has a NASA-funded research assistantship but the grant expires soon. She is hoping to secure a teaching assistantship to carry her through her doctoral program. Heather must rely on departmental funding because she is ineligible to receive federal government-funded fellowships as a non-U.S. citizen. Heather says that the funding she receives from NIES is "just enough" but certainly not commensurate with the high cost of living in the Northeast.

Heather has had the same male advisor for the past three years and she describes him as very encouraging. He meets with her on a regular basis and is always available to provide her with technical guidance for her research or refer to other faculty if certain parts of her doctoral thesis fall outside of his expertise. Heather said that her advisor has made her doctoral experience less stressful and her advisor has helped her move closer to finishing her degree. Heather describes the culture of her Aeronautics and Astronautics department is very collaborative, welcoming, and supportive.

Degree progress and the gendered environment. Heather is currently working on her doctoral thesis/dissertation proposal, and she recently passed her qualifying

examination. Heather says that the course administrator, the faculty in the department, and more advanced doctoral and post-doctoral students have been helpful for her degree progress. The non-competitive atmosphere of the department and the emphasis on collaboration makes the doctoral experience enjoyable and keeps Heather motivated to continue in the doctoral program. The most challenging aspect for degree progress for Heather is keeping herself motivated to stay on track to meet departmental milestone deadlines. The PhD program guide does not provide guidance about how to transition from one milestone to the next. Heather has an incentive to graduate as quickly as possible because her funding will run out soon. Heather is the only woman in her lab working on her space systems project, but she sees being the only woman as an advantage because when she meets with outside (mostly male) clients for the space systems project, they are sure to remember her and her work as the only woman.

Heather does not think that the supports or challenges doctoral students experience are any different for men or women, and overall, gender has not mattered to her doctoral experience within NIES because doctoral students are judged objectively based on their accomplishments. However, women face the challenge of being taken seriously by other people (mostly men) in Engineering at professional conferences, but these sexist ideas stem from society rather than within her doctoral program, which she describes as very supportive of women's success. Heather hopes to complete her degree by Fall 2013, and at the latest June 2014. After she graduates, Heather says her dream job is to work for NASA doing machine design for space surface exploration because it combines both research and industry. Later in life, she wants to become a professor so that she can have more flexibility to raise a family.

Maureen, The Academic Chemical Engineer (3rd Year Student, Thesis/Dissertation Research)

Motivation for and impressions of doctoral study. Maureen is a White woman in her mid-twenties who just began her third year in the doctoral program in Chemical Engineering at NIES. Maureen grew up in Ohio and attended a public high school. Maureen had always enjoyed math and science but it wasn't until the summer between her junior and senior year in high school when she found an advertisement for a Chemical Engineering job did she begin to think about becoming an Engineer. She attended a summer Engineering camp, and eventually applied to five or six large public universities with reputable Engineering programs within a 300-mile radius of home. She decided to attend the University of Michigan and major in Chemical Engineering because she received an academic scholarship. Maureen liked Engineering because it was a degree where she could get a job as an Engineer with a bachelor's degree, and she didn't want to go to graduate school yet. Instead Maureen worked for an appliance company for three years before she decided to pursue graduate school, because she was more interested in the data and the research side of Chemical Engineering.

Maureen applied to doctoral programs in Chemical Engineering and ultimately decided to attend NIES because the focus on graduate students and conversations with the current students and professors in the department. When Maureen first arrived to the Chemical Engineering department at NIES she was nervous that her background was not as technical as many of her peers. Maureen was very anxious about coursework and the process of finding an advisor. Maureen remembers feeling welcomed and thought the faculty and students were personable and non-competitive.

Doctoral student experiences. Maureen just presented her doctoral thesis/dissertation proposal and is completing her remaining course requirements. During the academic year, she also takes a course or two each semester. She typically works in the lab about 50 hours per week collecting samples and conducting research for her doctoral thesis. She is involved in orchestra, plays in a band with some other doctoral students in the department, and also is a resident assistant in one of the residence halls on campus. Maureen's doctoral education at NIES was fully funded through the Chemical Engineering department throughout the first year. The department paid for Maureen's tuition, health insurance, and a $32,000 annual stipend paid monthly to cover the cost of living. Maureen received an NIH fellowship starting her second year which covers tuition, health insurance, and the same stipend amount for the remainder of her doctoral program. Maureen says that she has not ever heard of any doctoral student being dropped from a research project because of funding, and she believes that stipend amount she receives is adequate to cover her living expenses.

Maureen's chose her advisor during her first year, and her advisor is one of the four female faculty in the Chemical Engineering department. Maureen describes her advisor as personable and very straight forward, and the advising relationship is better than what is typical for the department in the sense that her advisor makes herself readily available and proactively provides additional professional guidance and encouragement to prepare for an academic career in Chemical Engineering. Maureen says her advisor has had a positive impact on her doctoral experience but up until this point her advisor has not influenced her doctoral degree progress. Maureen believes that the culture of the Chemical Engineering department is fragmented and that there is a stronger culture

within her research lab. Maureen says the culture of Engineering is separated into application-focused industry Engineering and scientific and research-focused academic Engineering. Maureen says the environment of her lab at NIES encourages much more interaction than the one at her industry job.

Degree progress and the gendered environment. Maureen has made significant progress during the past two years at NIES. Maureen says that her peer group in her lab has been helpful for her degree progress because she doesn't see her advisor as often. Also, Maureen's advisor is proactive in making sure she meets the milestones which enabled Maureen to complete her thesis proposal on time. Also, Maureen likes that the NIES funds graduate student clubs and activities which helps build community. One of the challenges Maureen had was scheduling thesis committee meetings because of professors' busy schedules and limited availability. Other than that, Maureen says she has not yet experienced roadblocks in her degree progress, but she says a common challenge for doctoral students in her department is fighting the isolation of working on independent research. Maureen says both men and women face the challenge of isolation when having to complete their thesis research but isolation manifests differently in men and women. Maureen says she notices that the male doctoral students seem more okay with sitting by themselves for long periods of time, whereas the female doctoral students need to interact with other people to help keep them going.

Maureen says that being a woman in Chemical Engineering has been a positive for her doctoral experience because she was able to take advantage of the resources provided to graduate women at NIES such as participating in women-only graduate student organizations and participating in professional development workshops geared

toward encouraging and preparing women to enter academic careers in the science and engineering fields. Overall, Maureen believes that NIES, her department, and her doctoral program have provided a supportive environment for women doctoral students. Maureen is more concerned that being a woman will definitely matter if and when she decides to enter the academic job market. Even though women with doctorates in Engineering are heavily recruited into faculty positions, she believes that women faculty, once hired, face the challenge of successfully integrating into male-dominated Engineering faculty department and often seek out female role models to help cope with the gendered environment. Maureen hopes to graduate with her doctoral degree from NIES by 2015, and her career goal is to pursue an academic career as a tenure-track professor in Chemical Engineering.

Danielle, The Geo-technical Engineer (4th year student, Dissertation Research Phase)

Motivation for and impressions of doctoral study. Danielle is a White woman in her late twenties and in her fourth year studying Environmental Engineering, with a focus in Geo-technical Engineering at NIES. Danielle was born in and grew up in Canada and attended a public high school. Danielle was exposed in Engineering in high school when she participated on a robotics team building robots. She decided to attend the most selective university in her province in Canada because it has the strongest Engineering program, offered a co-operative education opportunity in which students could work full-time during their study, and she received a partial scholarship. After graduating from the University with a bachelor's degree in Geological Engineering, Danielle started working as an Engineering consultant for a company where she interned while in college. Danielle

thought a master's degree would open the door to more possibilities and power in managing people and projects, and so she applied to master's programs in Civil and Environmental Engineering and ultimately decided to enroll at NIES because of the full-funding package and the opportunities available. Her first impressions of NIES was that were that there were a lot of smart people, the institution was research-focused, and many graduate students were involved in clubs and organizations. Danielle perceived that the department and her advisor cared about their doctoral students' well-being and success.

Doctoral student experiences. Danielle originally began as a Master's student at NIES three years ago and just last year she decided switch into the PhD. Danielle is beginning her fourth year at NIES, and she spends about 50 hours per week working on her doctoral thesis research, either at home or in the lab. Danielle has received full financial support for the cost of her doctoral education, including full tuition, health insurance, and a monthly stipend from her department at NIES as part of research assistantship (RAship). Danielle thinks that the funding package she receives at NIES is adequate and is comparable to what other Engineering doctoral students in the US are making at other institutions. The one disadvantage is that as an international student, Danielle says she is restricted from taking on additional work because her visa restricts work to the RAship.

Danielle has had two advisors throughout her time at NIES. Danielle was assigned a male advisor her first year for academics, and she switched to her current male advisor, the primary investigator (PI) in the research lab because she believed the PI would look out for her best interests, both academically and professionally. Her current advisor is a part-time lecturer in the department, and Danielle is extremely satisfied with

the quality of her relationship. If it weren't for her advisor, Danielle said she would not have stayed to earn her PhD at NIES. Danielle perceives the culture of the third floor lab where she works as collaborative and friendly.

Degree progress and the gendered environment. The only milestones Danielle has yet to complete are the thesis committee meetings and her thesis defense. Danielle said that her advisor is the most important person for her decision to stay at NIES and pursue the doctorate. Danielle also likes that her department and doctoral program has clear guidelines and timeframes for completing the milestones. However, there is room for ambiguity about the process for completing each milestone. Danielle also mentioned the importance of campus clubs and organizations and her own persistence and motivation for completing her degree on time. Danielle says that she has faced setbacks in her research and in her first advising relationship which have challenged her degree progress.

Danielle says that being a woman has not mattered to her doctoral experiences in Engineering at NIES and that the faculty and her mostly male colleagues treat her like any other doctoral student based on the merit of her research. Danielle believes that Engineering is not a hostile environment for women, and the reason why there are fewer women in Engineering is because women aren't interested in doing Engineering in the first place. Danielle anticipates that she will complete her PhD in about a year and a half, in 2014. After graduation, Danielle wants to pursue a career in industry as a project manager Engineer.

Elaine, Starting Over with a New Advisor (5th Year student, Dissertation Research Phase)

Motivation for and impressions of doctoral study. Elaine is a 25-year old White woman and beginning her fifth year in the doctoral program in Materials Science and Engineering at NIES . Elaine grew up in New York City and went to a public high school where she was captain of her competitive debate team. Elaine attended a highly selective private university on the west coast for college. Originally, Elaine thought she would study law because of her interest and experiences doing debate; however, she was good at math and science and she really enjoyed those classes. She decided to major in Materials Science after taking the introductory course during her sophomore year. Elaine became interested in continuing on to graduate study after talking with the graduate students in the Material Science department. She decided to pursue a doctoral degree because she enjoyed the research she did as an undergraduate and PhD programs prepare students to become researchers or work in academia. Elaine's professors helped her generate a list of PhD programs to apply to as a senior in college. Ultimately, Elaine decided to on NIES because of the overall academic reputation of the Materials Science and Engineering department and the faculty doing research in her area of interest, Polymer Science, were there. Upon arrival to NIES, Elaine thought her doctoral program orientation was helpful because she met her fellow peers and faculty. Elaine perceived the faculty in her department as friendly and supportive but she thought her doctoral peers were competitive. Elaine remembers feeling lost in her research lab her first year.

Doctoral student experiences. Elaine is in the thesis research phase of her doctoral program in Polymer Science and Technology at NIES, and so she spends the

majority of her time in the research lab running experiments. For the first three years of her doctoral program, Elaine was funded through an NSF fellowship which paid for her tuition, health insurance, and an annual stipend of approximately $32,000. However, the fellowship expired in 2011 and her advisor decided to leave NIES that same year, and so Elaine found additional funding and served as a teaching assistant (TA) for one semester. After that semester, Elaine found her new advisor and a new grant which funds her stipend and health insurance since she no longer is taking courses. Elaine thinks the funding package she receives at NIES is adequate to cover her living expenses but she is not saving any money due to the high cost of living in the Northeast area. Elaine had a male advisor for the first three years of her doctoral program. Elaine said her advisor had a very hands-off approach to overseeing her work in the lab, and eventually he left NIES at the end of Elaine's third year to become a department chair at another university. Elaine was not satisfied with the quality of her relationship with her former advisor and that his lack of direction impeded her degree progress. Elaine has been working with her new advisor, also male, for about six months at the time of the last interview, so she said it was too early to determine whether she was satisfied with the quality of the advising relationship. However, her new advisor provides much more structure and opportunities for presenting her work at conferences which has helped move her research and degree progress along. Elaine describes the culture of the Materials Science department as collegial in the faculty are personable in the classroom, but not in the lab. She says that NIES and her department expects doctoral students to be proactive and to have technical confidence in their ability to do an experiment and get a result.

Degree progress and the gendered environment. Elaine is beginning her fifth year in the doctoral program and is working on her doctoral thesis research. Elaine said that her own motivation and the encouragement she has received from her current (new) advisor has helped her degree progress. Her former advisor somewhat inhibited her degree progress because his advising style and the lab environment was not a good match with her personality. The combination of the lack of direction and structure in the lab and her own fear of making mistakes slowed down her research and by extension, her degree progress. Nevertheless, Elaine says that finishing the degree is her own responsibility and nobody else's.

Elaine says her supports and challenges in her degree progress have nothing to do with being a woman and more to do with her individual personality. She believes that Engineering doctoral education is not supportive of women or men and that the field is very competitive for everyone. Elaine hopes to finish her PhD in Materials Science Engineering with a focus in Polymer Science and Technology by 2014. Elaine is undecided about her career path, and her decision will likely depend upon the available jobs when she is ready to graduate. . Right now, she is leaning away from a career in academia as a professor because the job market is very competitive and it is difficult to get a position that pays well. Instead, she is considering careers in science research, policy, and journalism.

Amie, The French Research Scientist (5th Year Student, Completed Dissertation in Fall 2012)

Motivation for and impressions of doctoral study. Amie is a White French woman and a fifth-year doctoral student who recently graduated with her doctoral degree

in Materials Science and Engineering at NIES in Fall 2012. Amy is a French citizen and chose to pursue the science track in high school. Amie took preparatory classes to enter the scientific grandes écoles," or universities in France. She attended an Engineering school near home in Paris because Engineering was the field that the most academically talented pursue in France. Even though Amie didn't specifically study Materials Science, the nature of the curriculum was such that it linked chemistry, mechanics, and biology which make up the Material Science field. Amie originally decided to pursue a Master's degree in Materials Science Engineering because master's degrees are valued in France in order to assume leadership and managerial positions in Engineering industry. She decided to come to NIES because of the scholarship she received and her boyfriend was already a graduate student at NIES. Amie began her first semester at NIES in the Spring, one semester later than her classmates in her cohort. Upon arrival, Amie remembers being impressed by the intelligence of the American graduate students and found her professors to be more approachable. However, she felt like she didn't quite belong with the American-born peers, nor the international students.

Doctoral student experiences. Amie spent five years at NIES, and throughout her last year she worked on finishing up her experimental research and writing up her doctoral thesis. She typically spent between 50 and 60 hours per week in the research lab in addition to playing in a wind ensemble three evenings each week. Amie received a doctoral fellowship from NIES to fund her doctoral education during the first year, which covered the cost of her tuition, health insurance, and a monthly stipend. After the first year, Amie secured a research assistantship which pays the same as the fellowship but was secured through a grant. Amie said that doctoral students in her department are

typically funded for as long as it takes them to complete the PhD, which is typically five to six years. If doctoral students choose to serve as a teaching assistant for a semester, they are paid a slightly higher stipend because the teaching work load is in addition to the hours spent in the lab. Overall, Amie thinks that the funding package she receives is just enough to cover the cost of living as a single doctoral student but inadequate for students who have to support a spouse or children.

One of the main reasons Amie stayed at NIES to earn her PhD is because she was enjoying the research she was doing with her advisor. Amie chose her male advisor after a couple of months of beginning her master's program because he is hands-off but yet very supportive of his doctoral student advisees. Amie says her advisor has made her doctoral experience more positive because he lets her go about her own research in her own way and this autonomy has enabled Amy to progress through her doctoral program rather quickly. Her advisor allowed her to switch research projects, and thus her doctoral thesis topics, when she expressed her discontent. Amie says that the Materials Science department values diversity in academic background and the importance of a common body of science knowledge. Amie describes the faculty as collegial with one another and the students. The culture of Materials Science as a field is focused on innovation and building things for the purpose of solving everyday problems

Degree progress and the gendered environment. Amie has been a doctoral student at NIES for four and a half years. She defended her thesis and completed her PhD in Fall 2012. Amie decided to stay at NIES mainly because of her life outside of doctoral study. Amie attributes her timely degree progress to the progress sheets she and her advisor complete each semester and her own motivation to finish the degree. Amie's

research lab peers have also been helpful for conducting experiments, but at the same time she says her peers can negatively impact her progress when they are reluctant to share information.

Amie mentioned that the Materials Science department sponsors an organized group for the graduate women, but participating in these women-only events was the first time she became aware that her gender mattered in order to receive additional support from the department. Amie believes that both men and women have the same successes in her doctoral program, and the only challenge for women is confidence in operating the equipment. Amie believes that Engineering doctoral programs are not more supportive of men than women; she believes that her doctoral program treats men and women equally. In science, doctoral students are judged on research results and that is all that matters. After completing her PhD in Fall 2012, Amie recently found full-time employment in the Northeast area working as a research scientist.

Madelyn, The Career Changer (5th Year Student, Completed Dissertation in August 2012)

Motivation for and impressions of doctoral study. Madelyn is a 30-year old Asian American woman who just completed her fifth year in the doctoral program in Aerospace Engineering in the Aeronautics and Astronautics department at NIES. She was in the process of writing up her doctoral thesis at the time of the interviews, and she graduated with her PhD in August 2012. Madelyn grew up and attended a large public high school in the suburbs of Chicago. Madelyn was first exposed to Engineering in high school when she built a boat out of cardboard as part of an outreach program. Ultimately, Madelyn attended the Northeast Institute as an undergraduate student where she decided

to major in Chemistry since it was her favorite subject. After graduating, Madelyn immediately enrolled in law school at a private university in the area since she always had an interest in Law; she did not want to pursue a PhD in Chemistry because an academic career did not appeal to her.

It wasn't until Law school that Madelyn realized the law environment was not a good fit for her. Madelyn wanted to return to math and science, and she had always had a curiosity about space flight since she was young. Her husband was enrolled in a doctoral program in Engineering at NIES, so she decided to take a class and apply to the doctoral program in the Aeronautics and Astronautics department there. Madelyn was admitted, and she says that in part deciding to do a PhD was a way to escape from the law career path and the pressure of working long hours at a big firm. Madelyn's first impression of NIES was that achievement in science research was very much valued. She noticed that there were very few doctoral women compared to chemistry as an undergraduate student. Madelyn said her peers were very collegial and supportive of one another, and the faculty affirmed her decision to make a career change.

Doctoral student experiences. Madelyn was writing up her doctoral thesis at the time of her interviews, and she graduated August 2012. Much of her work involves running simulations or analyzing data compiled from the experimental lab on her computer. On average, Madelyn spends between 40 and 60 hours each week working on her thesis research. Madelyn is fully funded by her department at NIES through a research assistantship which pays for her tuition, health insurance, and a monthly stipend. In addition, she and her husband live in the residence halls as a resident tutor and in exchange, they receive free rent and a small stipend. Madelyn thinks the funding package

she receives is adequate to cover the cost of living in the area, even if she didn't have free rent. Madelyn didn't use loans to pay for her PhD but she did have to take out loans to pay for law school since most law students pay full price.

Madelyn has had the same advisor for the past five years at NIES. Madelyn's advisor is a relatively young man and he received tenure a few years ago. Madelyn describes her relationship with her advisor is very close. Madelyn says her advisor is very great at giving technical advice, but could be better at time management. Madelyn thinks that her advisor is the most important person for shaping her doctoral experience and moving forward in her research and degree progress. Madelyn described the department culture as innovative and research-oriented. She described the peer culture as collaborative and supportive and the faculty as open-minded.

Degree progress and the gendered environment. Madelyn completed her thesis and graduated with her PhD in August 2012. She has said that having a helpful advisor has been the most important factor for completing her degree. Madelyn also talked about the critical role of the administrators in the Aeronautics and Astronautics department, the structured program manual in setting doctoral students' expectations for milestones, and the financial support she received for completing her degree in five years. Madelyn's challenges have been inaccurate research results and failing her qualifying examination the first time. However retaking the exam a second time the following year did not hurt Madelyn's degree progress because she could still focus on her thesis research while studying for the qualifying exams.

Madelyn thinks that men and women are equally successful in completing their doctoral degrees in her doctoral program. Interestingly, in her experience she mentioned

it was more common for the men to have this "existential angst" about whether the PhD program is a good fit, whereas the doctoral women had taken their time in deciding to pursue a doctoral degree in Aero-Astro Engineering and thus did not appear to be as anxious as the men. Being a woman has not had a negative effect on Madelyn's experience within NIES, but her gender has been a factor in her interactions with others outside of NIES. Many of the military clients she works with do not take her seriously and subtly question her abilities. For example, Madelyn had had meetings with these military clients and the men have questioned her computational calculations of various space systems phenomena, and Madelyn said that she speculates that being a woman is part of the reason.

Madelyn believes that her doctoral program does provide a supportive environment for women but that she can see how doctoral programs in female-dominated fields are more supportive because of the many female role models women can look up to as fellow students and faculty. At the time of her interview, Madelyn was writing up her doctoral thesis, and she completed her PhD in August 2012. Madelyn plans to return to the law field and has already has accepted a job at a medium-sized intellectual property firm in the area which hires math and science PhDs. She likes that this job will give her the opportunity to combine both her law and science background to help clients protect their research ideas.

Sara, Lowering Expectations to Avoid Disappointment in Civil Engineering (3rd Year Doctoral Student/5th Year Student, Completed Dissertation in June 2012)

Sara is a Middle Eastern woman in her early thirties who recently completed her dissertation in Civil Engineering at NIES in June 2012. Sara was born in Maryland but

her parents immigrated to the United States from the Middle East when Sara's father began his medical residency. During her junior year in high school, Sara had a calculus teacher who was instrumental in Sara's decision to pursue a career in math, science, and Engineering because she reaffirmed Sara's natural talent and abilities. Sara originally became interested in Engineering because she knew that it was an intuitive combination between math and physics. Sara decided to apply early to John Hopkins University and study Civil Engineering because of a professor she spoke with there. Sara taught math in the math department and after graduating college, she joined Teach for America. After teaching, Sara returned to the field of Engineering and worked as a structural engineer for the U.S. Navy for a couple years before deciding to return to graduate school and earn a doctoral degree in Structural Engineering because she missed doing research. Sarah decided to attend NIES because of the research opportunities and the proximity of the institution to her family.

Even though Sara originally intended to earn a PhD, she left NIES after earning master's degree and passing qualifying examinations after two years for a full-time job at an Engineering firm in New York City. A few months after she started her job, the economy crashed and she lost her job, so Sara returned to NIES for another three years to finish the PhD portion of her degree program. Sara remembers being surprised that NIES has a vibrant student culture. When returning to NIES as a doctoral student, some of her peers were quite critical of her decision to return. Sara says that the doctoral students are treated differently in Civil Engineering department depending upon who their advisor is—doctoral students whose advisors are well-respected and bring in more money receive more attention than other doctoral students.

Doctoral student experiences. The majority of Sara's experiences over the last year have been dedicated to running simulations and writing up her doctoral thesis. Sara has served as a TA for every single semester of her doctoral program with the exception of one. In Sara's department, the funding is the responsibility of the doctoral students, which is not customary of Engineering departments at NIES. Sara teaches to pay for her tuition, health insurance, and a stipend. There was only one semester when she didn't teach and that was because she applied for and received a fellowship. During the summers, she works 20 hours per week as a mentor for a summer research program for high school students, which pays her a stipend the equivalent of what she would be earning as a research assistant.

Sara has had the same male advisor during the three years she was enrolled in her PhD program in Civil Engineering. Her advisor was welcoming and supportive of Sara returning to NIES for her PhD. Sara's advisor has had a significant influence on her doctoral experience in that he has validated her confidence in becoming an academic in Structural and Mechanical Engineering In fact, Sara's advisor and another thesis committee member pushed Sara to finish a year earlier than she originally expected. Sara believes that the Structural Engineering program within the Civil Engineering department cares a lot about research money. The doctoral students in her department are not very social, partly because there are so few of them, and partly because since they aren't part of a lab, she says it is hard to form a strong peer network. Also, she does not believe that the faculty truly cares about the success of their doctoral students, although she says her advisor is an exception.

Degree progress and the gendered environment. Sara recently defended her thesis and graduated with her PhD in Structural Engineering in June 2012, only three years after returning to NIES for the PhD portion of her program. Most of the support has helped Sarah her earn her PhD is specific to the Northeast Institute and NIES rather than her Civil Engineering department. Sara mentioned that the professional development workshops, the women's organizations, and the Dean of Graduate Students' office, and the support staff in the Civil Engineering department have been particularly helpful for Sara's degree progress. Sara said the fellowship funding she applied for and received through the Mechanical Engineering department, even for just one semester, helped speed up her degree progress by a whole year because it was the one semester she could 100% focus on her doctoral thesis. Sara said a challenge was feeling confident when she first returned to NIES after having lost her job. Sara said that not knowing where her funding is coming from each semester has caused added stress, and the hours spent teaching every single semester for the past three years has taken time away from her thesis research, and in turn inhibited her degree progress. She mentioned inconsistent thesis committee members as a difficulty, especially during the writing stages, and the lack of work-life balance as additional challenges.

Sara is also the only female doctoral student in her PhD program in Civil Engineering, and she also has served as the only female TA for a structural mechanics class for the past few years. As a Middle Eastern female TA, she has experienced skepticism from her mostly White male undergraduate students about her competency and knowledge of structural and mechanical Engineering. During lectures, her teaching style and the problem sets she has assigned as homework have been continuously

questioned by the undergraduate students taking her class, and so she has had to remain firm and work hard to earn the confidence of her students. Although she has experienced difficulties being the only female TA and an underrepresented minority in the department, Sara believes that the supports and challenges she has experienced while taking courses and writing her doctoral thesis have nothing to do with being a minority woman. For Sara, the doctoral experience by design is challenging for both women and men, and she believes that there isn't much support for either gender. Now that she has earned her PhD, Sara is moving to the United Kingdom to complete a post-doc for a year or two in order to produce some research publications. After completing a post-doc, she plans to enter the academic job market and apply for tenure-track professor positions at teaching institutions.

Whitney, Choosing Her Thesis, Instead of Letting the Thesis Choose Her (7th year Student, Completed Dissertation in June 2012)

Motivation for and impressions of doctoral study. Whitney is a White woman in her mid-thirties and a seventh-year doctoral student who completed her PhD in Environmental Engineering in June 2012. Whitney grew up in Florida and attended a public high school which is when she first became interested in math and science. She ultimately attended an Ivy League institution for college and majored in Chemistry because of its strong academic reputation and also she could play competitive softball there. While in college, Whitney took a lot of classes in the geological science area, and completed a senior research thesis with a geo-science professor. Graduate school was never on Whitney's radar until she finished her senior thesis and realized she truly enjoyed research. After college, Whitney searched for jobs in research and soon realized

that many of the jobs that interested her required a PhD. Thus, after working in a microbiology lab as a technician for three years, Whitney decided she would apply for PhD programs in Environmental Engineering because it focused on environmental science research but had immediate application for solving environmental problems. Whitney decided to enroll at NIES because of the research going on there in her area of interest and the positive departmental environment; in addition her husband was already at NIES earning his PhD. When Whitney first arrived at NIES, she perceived the Northeast Institute's culture as very intense, but she found this culture was not shared in the Environmental Engineering department. Whitney perceived the faculty as supportive and great teachers, and the doctoral students as collegial.

Doctoral student experiences. Throughout her seventh and final year as a doctoral student, Whitney spent most of her day in the research lab analyzing data, and continuing to write her doctoral thesis/dissertation. Whitney was awarded two NIES fellowships to fund her doctoral education during her first two years. The fellowship covered her tuition and health insurance, and paid her a monthly stipend. After her first two years, Whitney received funding through the research project she has been working on in the lab for the past five years. The stipend pays about $32,000 per year, including the summers. Whitney believes that the stipend she receives is adequate to cover her cost of living in the area but does not enable her to have savings. She believes the funding doctoral students receive is enough to support an individual person but not a married couple or a couple and children.

Whitney has had the same male advisor throughout the last seven years in the Environmental Engineering department at NIES. She describes her relationship with her

advisor as very, very good. She says her advisor is incredibly smart, responsive, and truly cares about his students. Whitney's advisor lets his students choose their own research projects for the doctoral thesis, and so unfortunately working with her advisor has slowed her degree progress because Whitney has had to spend extra time writing grant proposals to secure funding for her doctoral thesis. Whitney describes the culture of the Environmental Engineering department as welcoming and social. The faculty and staff make doctoral students feel a part of the community. The doctoral program focuses on preparing students for academic careers as faculty or researchers in Environmental Science.

Degree progress and the gendered environment. Whitney recently completed her doctoral thesis/dissertation in June 2012 after seven years of full-time study which is pretty typical of doctoral students in Environmental Engineering. She says the community environment of her department and her research lab and the feedback she received from her advisor throughout the whole experience helped her degree progress. However, the dissertation development and writing process was not very structured, and Whitney believes that the lack of structure, her own inability to set deadlines, and the difficulty of finding funding for her dissertation challenged her degree progress.

Whitney has always thought about how being a woman will affect her career as a professor, but she does not think her gender affected the nature of her doctoral experience. The gender composition of the doctoral students in the Environmental Science department is much more gender-balanced than at the faculty level. This has meant that Whitney has plenty of female friends to share her doctoral experiences with but fewer women faculty in the department to look up to as role models and mentors.

After completing her PhD, Whitney is hoping to secure a post-doc research position which will prepare her for the academic job market next year. She plans to apply for tenure-track Assistant Professor positions in Environmental Science and Environmental Engineering departments.

Susan, The Sixth Year Veteran (6th Year student, Dissertation Proposal and Research Phase)

Motivation for and impressions of doctoral study. Susan is a Korean-American woman in her late twenties, and she just began her sixth year in the Aerospace Engineering doctoral program at NIES. Susan grew up in Pennsylvania with a twin sister who is also currently a doctoral student but is majoring in pure science. Susan's mother pressured Susan and her twin sister to pursue science or Engineering because her father is a scientist. Susan and her sister went to space camp one summer when she was 13 or 14, and that was when she fell in love with space. Susan liked that Aerospace Engineering allows students to learn all the Engineering sub-specialties at once. She chose NIES because it was the best school in terms of academic prestige. While at NIES, Susan majored in Aerospace Engineering and worked in a research lab as an undergraduate. Susan always assumed she would go to graduate school because her mother in particular pressured her to get a PhD in the science. She figured she would earn a PhD in Engineering since her Bachelor's degree was in Engineering. As a senior in college, Susan applied to NIES and one other school and ultimately stayed at NIES because it was familiar. Susan's first impressions as a doctoral student were very different than as an undergraduate. Unlike her undergraduate experience, she said the doctoral program is much less structured and academic success is self-driven as opposed to deadline-driven.

She perceived the Aerospace Engineering department faculty as caring about students' professional development,

Doctoral student experiences. As a sixth-year doctoral student, Susan is working on the research which will eventually become her doctoral thesis. On a typical day, Susan will wake up in the late morning, and go to work in the research lab and work there until 2:00am. On heavy weeks she works approximately 80 hours in the lab and when her class assignments are heavy, she will only work 10 hours per week. For her first four years as a graduate student at NIES, Susan was funded through the research project by external companies who pay NIES for research to be done. NIES in turn funds Susan through an RAship, which covers her tuition, health insurance, and an annual salary in exchange for conducting research in the lab. For her fifth year, she won two different fellowships – one from NASA and one from the Aero/Astro department which pays a slightly higher stipend than her RAship. Susan also served as a TA for two semesters which paid her an additional stipend since it requires additional hours. Susan believes that her department provides adequate funding package to cover the cost of living in the Northeast for a single person, but if she had to support a family, the stipend she receives would not be enough.

Susan has had the same male advisor throughout her last five years as a graduate student and intermittently as an undergraduate student at NIES. Her advisor recently received tenure and leads the research in her lab and will also be the chair of her doctoral thesis committee. Susan says she has a strong connection with her advisor. She talks with her advisor mainly about research and professional development, but she considers her undergraduate advisor her true mentor who cares about both her personal and

professional success, and thus she still maintains a relationship with him as an additional source of faculty support. Overall, Susan says her relationship with her advisor has been pretty good – she likes that her advisor is honest in his feedback about her abilities and has helped Susan develop the needed confidence to move forward with her degree progress. However, she hasn't liked that her advisor has not been supportive of her active participation with the women's graduate student association activities because her advisor believes it takes time away from her research. Susan describes the culture of Aero/Astro-engineering department as being less about academia and more about training the next generation of Engineers who are able to solve problems and communicate well. Susan also says the department encourages graduate students to build community.

Degree progress and the gendered environment. Susan is beginning her sixth year in and is still working on her thesis research. Susan's degree progress has been slow, but steady throughout the last five years as a graduate student at NIES. Susan said that her advisor has been instrumental in encouraging her to move forward with her degree and instilling in her the confidence she needed to get back up again when she was knocked down. Also, Susan said her older lab mates and peers and the department's regular surveys have helped her continue to move through her doctoral program. Once challenge that Susan faced was she failed her qualifying the exam, and failing deeply affected her self-confidence. Now, she is one year behind her cohort and will take seven years to complete her PhD instead of the normal six years.

When Susan first started as a doctoral student, she remembers her research lab was very gender-balanced. However, Susan noticed more of her female peers tended to doubt themselves, and she especially struggles with remaining confident in her own

abilities. Susan says she has never encountered any gender bias from her clients or professors; instead, she is treated equally and evaluated based on the quality of her research. Susan hopes to finish her doctoral thesis in a year and a half and graduate in 2014 with her PhD in Aerospace Engineering. After she completes her PhD, Susan said she is not exactly sure what she wants to do, but her one criterion is she does not want to teach nor work in academia.

The 11 Engineering women at NIES, on the whole, have had very positive doctoral experiences with their financial funding, their advisors, and their interactions with the faculty and doctoral peers in the departmental and doctoral program environment. Four of the 11 NIES women have completed their degrees within five to seven years, and the remaining seven women are still enrolled and are continuing to work on their doctoral thesis research. Financial funding was not an issue for women who were U.S. citizens, and like the Education women, the Engineering women at NIES talked about how lucky they were to have found an advisor who supported their professional and personal success and conduct research alongside their peers in the collaborative environment of the lab. Almost all of the NIES women believed that their gender was not a factor that mattered to their doctoral experience while at NIES. Some women did experience sexism and gender-related discrimination but never from individuals within NIES; this subtle and not so subtle sexism occurred mainly from funding agencies and society's stereotypes about men and women's abilities in science and engineering.

Summary

Each of the 21 women participants in this study has a unique story to tell about her motivations for pursuing a doctoral degree; the financial support, advising

relationship, and the culture of the department and program; as well as the supports and challenges to her own degree progress. As one can tell from the summaries, the 10 Education and 11 Engineering women are a diverse group of women who have very unique experiences but also share commonalities in their experience due to the fact that they are women living in the gendered institution of doctoral education and academia. In Chapter Six, I present the four major themes that emerged as a result of my interpretive phenomenological analysis which describe the similarities and differences in the lived experiences and degree progress of the doctoral women studying Education at NUES and the doctoral women studying Engineering at NIES.

CHAPTER SIX: FINDINGS

In the last two chapters, I introduced the 10 Education and 11 Engineering doctoral women I interviewed who shared their motivations for and impressions of doctoral study, their gendered doctoral experiences, and their supports and challenges to degree progress. This chapter provides an overview of the four major themes that emerged from the data analysis of the individual interview and focus group transcripts, exemplified using the words of the 21 doctoral women. Each theme is further separated into sub-themes, which display the similarities and differences between the Education and Engineering fields. These findings address the primary purpose of this research study, which is to compare and contrast the nature of women's doctoral experiences and degree progress in the two gendered fields of Education and Engineering. The next chapter (Chapter Seven) will address the established research questions which aim to identify the gendered culture of doctoral education in these two fields and explain how these gendered environments contribute to differences in experience and degree progress.

Theme 1: Alignment Between the Assistantship and the Dissertation

The Education women at NUES reported fewer positive doctoral experiences and more challenges to their degree progress as a function of the level of financial support and the alignment between the paid assistantship and the dissertation. Overall, the 21 doctoral women reported relatively positive doctoral experiences, since they are all either still enrolled in their doctoral programs or have graduated and earned their degrees during the course of this research study. The 10 Education women I interviewed reported relatively fewer positive doctoral experiences and experienced more challenges to degree progress than the 11 Engineering women because of the nature of

the financial funding and the degree of alignment between each woman's paid assistantship work and the dissertation.

Theme 1A. The Education women expressed dissatisfaction with the level of financial funding they received from the department; the paid assistantships required that the women perform work to benefit other people, mainly faculty, which inhibited their degree progress because they had less time to work on their own dissertation.

All 10 Education women I interviewed were dissatisfied with the level of financial support they received from their doctoral program or department. Most of the women mentioned that their doctoral program covered the cost of their tuition, fees, and health insurance for up to five years, which is the typical length of time it takes NUES students to complete the doctoral degree. For the first year only, Education students receive a $10,000 stipend to cover living expenses, but they all agreed it was not enough to afford to live in the Northeast. Since many of the women were unwilling to take out loans and there are more paid part-time research and teaching positions available than there are doctoral students to fill them, most women worked between three and five part-time jobs simultaneously during each year of their doctoral program. Although some of the women served as research assistants (RAs) for their advisors or other professors in the department, they said there were more opportunities to teach, and the norm was that many of the women did both research and teaching while studying full-time. Education doctoral women said they earned about $4,500 per course in exchange for 10 hours per week of serving as a teaching assistant (TA). An example of this work load is Laura, a third-year doctoral student at NUES who taught a statistics course this semester and

simultaneously took on various short-term research projects for different professors in the department in order to earn enough money. Here is how she described her work experience during her time at NUES:

> So the first year I was here I worked at this research center down the street like 20 hours a week and then …work for a couple of professors doing smaller projects on the side... This semester, I've done like other research assistantships, on-going stuff, and then like in the summer try to make as much money as I can. Last summer I went back and worked for my old company that I was working for before going back to grad school.

Rachel's experience also illustrates the multiple responsibilities that students take on to finance school and living. As a 6th-year NUES student who earned her doctoral degree in Education Leadership, Rachel TAed 16 courses over the past five years at NUES. When asked why she took on these responsibilities she shared,

> I do it [teach] for two reasons, one the money which is very bad, I got $5000 [per course], but second I do it because I would like to teach and I miss that. . . It also helps me feel connected to the organization because I recognize faces, like there are 600 Master's students . . . I feel like I'm part of the community.

Rachel taught these courses in addition to conducting research, writing grants, and publishing papers with her advisor for the past four years. However, taking on these paid work responsibilities meant Rachel was working between 80 and 100 hours per week across her six or seven part time jobs as well as dedicating time to working on her dissertation. Yet, Rachel was quick to point out that what she did was not typical of

NUES doctoral students. She says the only way she was able to work on her dissertation was by hiring a nanny to take care of her boys so she could finish her dissertation. Rachel shared,

> I mean, that's why I have a nanny... And that's how I have been able to do my dissertation because the other option either I would be home, we probably would only be able to afford two days a week or something. And then I would be home three days a week with them.

Four of the 10 Education women interviewed were mothers, but most of them had young children and a partner to assist with childcare and the financial support. One of the four women was the anomaly of the group - Louisa, a single mother, talked about the difficulties of raising her son on a full-time student salary. Louisa said she struggled to make ends meet and has had to take out loans each semester of last two years she has been at NUES. As a third-year student, she planned to take out loans this year, in addition to working as an RA and potentially teaching a course next year. Louisa believes that the financial support from the department, particularly the stipends, are inadequate to finance the high cost of living in the Northeast area, especially since the NUES doctoral program requires students to study full-time. Louisa comments,

> I think it's really inadequate to ask people to be full time doctoral students and not give them a living stipend and being in the Northeast, like it just doesn't make any sense. Anybody [else] who gets a PhD at Northeast University in Arts and Sciences has a $19,000 annual stipend basically for them to live, right. So people at NUES . . . also have to work.

In comparison to other doctoral programs at Northeast University, not only are the stipend amounts less at NUES, but also NUES students have to work to earn those stipends as RAs or TAs, whereas almost all other doctoral students enrolled graduate schools at Northeast University automatically receive more funding without having to work in return. The need for Education women at NUES to work and take on several part-time assistantships while trying to focus on their own research and dissertation inhibits their degree progress.

Not all students were willing to take on so many additional paid assistantships during their doctoral experience. In contrast, Alicia, a third-year NUES student studying Human Development said that besides her first year, she purposely did not take on any RA or TA positions, not even to gain more experience to add to her curriculum vitae. Alicia said teaching someone else's courses was not something she wanted to do after spending 12 years as a teacher. "I felt what doctoral students are asked to do, is not what I'd define as teaching. And so it would make me very unhappy to have to do what we're asked to do. I'm fortunate enough that I don't have to do it for financial reasons." Instead, Alicia took on a RAship her first year because she wanted to become closer with her advisor. However, she expressed concerns about the idea of doing work for someone else research and not her own, sharing, "I hated not doing work for myself. It felt like something is – this is going to sound horrible, that you do when you are younger, not once you've had an entire career. I felt like what I was doing was not going to be useful for my future plans."

Thus, since Alicia did not believe she was gaining valuable skills for her future career, which does not involve pursuing an academic career, she decided not to take on a

second RAship. She says she was also able to do this because she had a partner who could financially support her so performing paid assistantship work was not necessary for Alicia like it was for the other Education women – she had the choice whether she wanted to take on paid assistantship, whereas the other women did not perceive they had the choice – taking on multiple part-time jobs was necessary to fund the cost of living without having to take out loans.

Instead of spending time performing research for someone else, Alicia chose to spend time working on her own research, qualifying paper, and writing grant proposals, and it paid off. Alicia just recently earned a one-year $50,000 grant to begin her doctoral dissertation research -- half of this grant will be used for her living expenses. Alicia completed her qualifying paper at the end of her second-year at NUES, and as a third-year student, she is beginning her dissertation proposal, and will start data collection for her dissertation very soon after receiving the grant. The ability to focus on her own work has facilitated her degree progress because she is pursuing doctoral study on her own terms, not someone else's.

Theme 1B. Financial funding was not a concern for most of the Engineering women at NIES, as most research assistantships were well -funded by federal or corporate grants. The Engineering women performed research which served as the basis of their dissertation starting their first semester as doctoral students, which facilitated their degree progress.

The majority of the 11 Engineering women were not concerned about the level of financial support that the funding they received from their department/program and believed annual $30,000 - $32,000 stipend they received was adequate to cover the cost

of living in the area. This stipend was in addition to having tuition and health insurance paid for by the department or through a fellowship during their first year in the doctoral program while they searched for RAship positions. The remaining years of tuition were paid for often by federal agencies which granted federal dollars to NIES professors, which included funding for several doctoral student RAs. Almost all of the NIES women mentioned that faculty would not take on doctoral students unless the department or the grant was prepared to fund them. RAs typically work 12 months of the year and at least 20 hours per week.

Overall, NIES women were not concerned about their funding package, and in contrast to the NUES women, every one of Engineering women, except one, said their RA fellowship or assistantship at NIES was the only job they had. The women believed that the funding package they received was adequate to cover the cost of living for a single person in the Northeast, but not a couple or a family. Susan's response to this question, as a 6th year student in Aeronautics and Astronautics, exemplified the typical attitude among the NIES women about funding. She said that the funding package is "plenty enough funding for me to be – like a normal grad student. But I don't have a family. And so, for me, I tell the new students that come in, when they hear the amount of stipend, they're like, oh, how do you live with that. I tell them, it's enough to live, travel and drink, it's all you're going to need and you'll break even." Almost all the NIES women agreed that the annual stipend certainly was not enough to save money but was certainly enough to live on as a single person. Seven of the 11 NIES women said they were single and were not sharing expenses with another person, besides a roommate.

Even though most NIES women worked as RAs part of their funding package, some women took on teaching assistant (TA) opportunities because of the additional financial compensation they received from the department. TAs were often paid more money per semester than as RAs because the department recognized they are asking doctoral students to spend time teaching which takes time away from doing research and working on their dissertations. The financial incentive was a big reason why Elaine, a fourth-year doctoral student in Material Science, TAed for one semester as a "fall back" option when her NSF funding ran out. Elaine shares, "Yeah, I mean because I TAed in the past, but he [new advisor] told me that it would be bad for my progress if I continued to TA and so he would ensure that I would be able to have the support to not TA." However, Elaine's situation is atypical in that it is not common for students' funding to run out while they are assigned to a project. Elaine's professor decided to move to another institution at the same time the grant ended. Even though TAs are paid more money, doctoral students are not encouraged to TA; in fact, TAing is a "last resort" for most doctoral students who are temporarily in search of research or grant funding at NIES.

Although finding funding was seldom a worry for most of the Engineering women, four of the 11 women interviewed struggled at some point during their doctoral programs with securing full funding. Two of the four women expressed difficulty finding RAship opportunities because they were non-U.S. citizens. Most of the RAships available at NIES are funded by grants from U.S. federal government agencies, such as the National Aeronautics and Space Administration (NASA), National Science Foundation (NSF), and the National Institute of Health (NIH). Many of these federally funded grants

do not allow for non-US citizen doctoral students to work on these projects, Thus, non-U.S. citizen women had to find research or teaching opportunities solely funded by a NIES department. Heather, a third-year doctoral student studying Aeronautics and Astronautics and a European citizen mentioned how stressful that uncertainty was. She shared,

> So like I was doing the fellowship and now have a research assistantship on our NASA project, which is going to last until November. Then after that I have kind of little time to [find funding] which is difficult. So the department does help you find funding and I'm hoping to find a teaching assistantship for next spring. But it's obviously, not a guarantee, which is really stressful, because all the fees are extremely expensive.

Whereas Heather was concerned about the source of her funding, Danielle, an Environmental Engineering student from Canada, was frustrated that she couldn't take on any additional job besides her RAship, due to her student visa, sharing:

> The one disadvantage, I have, though is that I – I'm an international student, therefore I am restricted from taking additional work options . . . whereas a lot of my friends who are American are allowed to do other things, for example, work at the desks in the residences or work for professors on other projects.

Two other NIES women, Sara and Whitney, mentioned they were responsible for finding their own funding, especially at the dissertation/thesis stages, but their difficulties arose as a function of the department and doctoral thesis topic structure, rather than citizenship. Sara, a Civil Engineering doctoral student, had to find her own funding for every semester of the five years she attended NIES. Sara searched for TAships and taught

at least one undergraduate or master's level course each of the five years she attended NIES, because it was a reliable funding source. However, Sara said it was very stressful and time consuming having to figure out how she was going to fund her doctoral education each semester.

> In the end, the reason why I still went for it [the PhD] was, I mean I knew TA, I do enjoy teaching, the problem with it is it prevents you from achieving what you need to get done . . . it just makes you, it makes you feel like crap, because no one wants to invest in you. And then when you are busting . . . to like do a thousand things at once and on top of all of this I am constantly applying for fellowships.

Being a TA didn't help Sara's degree progress, and the fact that the department didn't provide research funding made her feel like the institution didn't care about her. Sara finally received a one-semester fellowship during her fourth semester as a PhD student which allowed her to concentrate on her doctoral thesis research; as a result, her graduation date moved up by one whole year. Sara finished her doctoral degree in five years.

Whitney, an Environmental Engineering student, took seven years to complete her degree because most of her time her last three years were spent writing grant proposals to fund her dissertation. This was because her dissertation topic was not within the purview of the funded research project she was currently working on with her advisor. Whitney shares,

> I was involved in a lot of grant writing. And it took us you know, several years of submitting grant proposals to finally get one. And that takes a lot of time and is not all that fun. So because of that like finding your own path and then having to

find funding for it, and I think that people in his [advisor's] group tend to take a little bit longer than some of the people in other groups and the department.

Whitney eventually secured her own funding through one of the many grants she wrote along with her advisor. Nevertheless, Whitney said she recognized that the grant writing process prepared her well for her future career goal as a tenure-track professor in academia, even it meant that she took an extra two years to earn her doctoral degree.

Sara and Whitney's struggles to find funding is atypical; most NIES women, especially U.S. citizens, do not pursue doctoral degrees in Engineering unless they are fully funded by the department or the primary investigator (PI) on the research project, who also serves as the student's faculty advisor. Thus, faculty advisors do not take on doctoral students unless they have a research grant or other external funding to afford to pay them to for four or five years of full-time study. Heather, Danielle, Whitney, and Sara did not expect to face the challenges they did with funding when they first began their doctoral programs, since Engineering as a field is known to be well-funded by national grants. Heather and Danielle as international students anticipated challenges related to the number of hours they could work as a research assistant on a student-visa, but Heather in particular did not expect there to be as many restrictions and limited opportunities to receive national grant funding for international students studying Aero-Astro Engineering. In Sara's case, she was more surprised that she would have to find her own funding as a doctoral student since she knew that doctoral students studying other Engineering sub-fields were well-funded at NIES. Despite the uncertainty about her funding source each semester, Sara knew she could always TA because she loved teaching and teaching was where the funding opportunities were. Thus, even though it

took away from her dissertation research progress, Sara could financially support herself as a TA. In Whitney's case, she consciously chose a dissertation topic that was not currently funded by a research grant, and so she expected that she would have to fund her dissertation research on her own. However, Whitney was able take on this challenge because her dissertation advisor helped her write the grant proposals to ensure she successfully secured external funding. If her advisor was not supportive of these efforts, the outcome may have been different for Whitney. Besides funding, the quality of the faculty advising relationship was another critical component for the women's doctoral experiences and emerged as the next central theme.

Theme 2: Lucky to Have a Good Faculty Advisor

Even though the faculty advisor matching process differed in the Education and Engineering fields, both groups of women said that their individual faculty advisor could "make or break" their doctoral experience and degree progress – those who had good faculty advisors perceived it was a matter of "luck." The quality of each woman's doctoral experience and degree progress varied as a function of the individual faculty advisor (for the Education women) or primary investigator (PI) in the research lab (for the Engineering women). Overall, the Education women reported that they had fewer positive doctoral experiences than the Engineering women, and this was often due to the quality of their relationship with the faculty advisor. Those women who had positive doctoral experiences and progressed quickly through program reported having advisors who were available and supportive of their professional and personal success. Specifically these same women expressed how "lucky" they were to have a good advisor, since having a good advisor certainly was not the norm for doctoral students in

their respective departments. In contrast, those women who had more negative doctoral experiences said their advisors were too busy to provide them with much guidance and were less invested in their doctoral advisees' professional success.

Theme 2A: It was common for the Education women to switch faculty advisors throughout the course of their doctoral programs because the advising relationship was not tied to their funding, whereas the Engineering women did not switch advisors because the advising relationship was directly tied to their funding.

All of the 10 Education doctoral women said they currently had worked with at least one faculty advisor throughout their time in the doctoral program at NUES. The Education women selected their faculty advisors from a designated list on their applications for admission to NUES, and typically the doctoral women were assigned to one faculty advisor from the group they originally chose. About half of the women reported meeting with their advisors on a regular basis, usually weekly or bi-weekly, and the other half met with their advisors more sporadically, usually two or three times each semester. The focus of these advising meetings depended upon their doctoral program phase. Five of the women who were in their second and third-year of their doctoral program met with their advisors for guidance on coursework selection, honing research interests, and writing the qualifying paper. The five women who were either working on their dissertation proposal, data collection, or data analysis used their advising meeting as an avenue to review dissertation writing or ask specific questions related to dissertation development. In addition to the faculty advisor, the Education women worked with other faculty as paid research or teaching assistants, and this faculty supervisor was often a

different faculty member than their dissertation advisor, particularly if the paid assistantship or project did not align with the individual student's dissertation research.

Most of the 11 Engineering women worked with advisors performing research related to their dissertations under the supervision of primary investigators (PIs) in their research lab. Even though most of the contracts they signed as part of the research assistantship required them to work 20 hours per week, that was the minimum number of hours expected of them as research assistants. Most of the Engineering women said their advisors didn't care how many hours per week they worked in the lab, as long as they met the expectations for producing the data output. The nature of the meetings between the Engineering women and their advisors seemed more "formal" than what the Education women described. The NIES doctoral women often prepared PowerPoint slides of data results and an agenda for each meeting prior to sitting down with their advisor. Most of the Engineering women met with their advisor on a monthly basis because their advisors supervised many doctoral students in the lab.

Many of the Education women were happy with their current advisors but indicated that they initially started off with a different advisor. It was common for the NUES women to switch advisors because the advising relationship is rarely tied to the funding arrangement such as a research or teaching assistantship. This advising structure in Education is an asset because it allowed the women more flexibility when choosing a dissertation advisor. Upon beginning the doctoral program, the Education women were assigned one advisor for assisting them with their class selections, research, and professional interests but had the freedom to work with any faculty member they wanted either within or outside NUES to pursue research, teaching, and even consulting

opportunities. Michelle shared, “We’re free kind of like to work with whomever, change advisors if we want to and so it’s not coincidental like I have the structural freedom to like talk to whoever I want to about whatever it’s encouraged, so I think that’s interesting.”

Since many of the incoming doctoral women were unsure of their specific research interests, it was common for the Education women to switch advisors after completing their second year of coursework and beginning the qualifying paper stage of the doctoral program. Louisa, a third-year doctoral student is starting to hone her research interests and as she begins to write her qualifying paper over the summer, she is contemplating switching her advisor because she realizes that their research interests do not align.

> They say that student should feel that they have free access to all of the advisors and if we mismatch you, you can change. . . Part of what I’m doing this summer is thinking about whether it makes sense to change [advisors]… as I’m becoming more clear about what my research interests are, things are getting honed down. So the first two years with my advisor has been great in terms of the general orientation towards the institution . . . courses, helping me explore like what my ideas were . . . now becomes an issue that is she the best person when things have gotten narrowed down or would I prefer to be with someone who does more sociology of education stuff? – Louisa, NUES Doctoral Student

At the time of the second interview, Louisa said she was in conversations with another professor whom she worked for as research assistant this past year, to see if this professor

would be her dissertation advisor due to their mutual research interests in the sociology of education.

In contrast to Education, the student-advisor matching process in Engineering is much more structured and intentional, partially because the faculty-student advising relationship is tied to the paid research assistantship. Many NIES doctoral students get to choose their advisor soon after beginning their doctoral programs and meeting the faculty in person. Departmental faculty who are seeking new doctoral students to work as RAs on their funded research projects will present to the first-year doctoral students. The faculty advisor matching process is a mutual one, in which the advisor and the doctoral student must both choose each other to work together. Maureen, a Chemical Engineering doctoral student, said that she considered personality when choosing her advisor, with whom she has a very positive relationship. She shared, "Yeah, I like working with [my advisor]. I mean, people have varied opinions on whether or not you should consider personality a lot when you pick your advisor but I did." For Amie, a Material Science doctoral student, the advisor's work style was the most important for Amie when choosing her advisor.

> I chose my advisor; I would say maybe two or three months after I joined Northeast Institute, I was – I kind of knew in which or where I wanted to be. But I still have the choice between a couple of advisors and after a meeting with couple of them; I could see the difference of style. The style was very important for me to choose my advisor.

It was common for NIES doctoral students to "match" with their first choice advisor, whom they had the opportunity to meet in person before deciding to work together. Few

of the NIES women changed advisors during their doctoral program, only because their research funding was tied to their advisor/PI in the research lab so it was a more difficult process to change advisors. However, one woman, Elaine, worked with her first advisor for her first three years at NIES and mentioned that her degree progress was stalled because her advisor gave her absolutely no direction in the research lab. Elaine finally switched advisors in her fourth year but only after her advisor left for a job at another university. She shared,

> I wish I had switched advisors earlier, because I feel like the, I think that he is a great advisor for some people, but I don't think that his skills were match for my needs, because he is very kind of hands-off, and he is very kind of like a big picture person and when I came to NIES I didn't have a lot of experience like directly working in labs. So I needed help with like how do you do this technique, like how do you use this piece of equipment effectively. And I was never really going to get that kind of help from him.

For Elaine, the mismatch between her advisor's work style and her own was the main reason why she did not get a lot out of the advising and research lab experience. Elaine said she basically had to start over with her new advisor in a new research lab, but Elaine says she is much happier because her new advisor had a more hands-on work style which she says she prefers.

In sum, the doctoral student - advisor matching process is much more intentional in Engineering at NIES because doctoral students commit to both a faculty advisor and a research project for the next five years of their doctoral program. Because Engineering doctoral students do not switch advisors during their doctoral program, the faculty-

student advising relationship represents a long-term commitment. The faculty advisor/PI is committing to funding the doctoral student for five years, and the doctoral student is committing to work on a particular research project with the same faculty advisor until they complete the dissertation. This long-term commitment is conducive for building a quality relationship of frequent interaction, guidance, and mentorship which in turn translates into a positive doctoral experience and more timely degree progress and completion. In contrast, the matching process in Education is less structured –doctoral students have more freedom to switch advisors because the advising relationship is independent of paid work opportunities as RAs and TAs. Thus, the Education women do not choose a dissertation faculty advisor until they have settled on their dissertation research topic. Because they don't often choose their dissertation research topic until after the coursework phage of the doctoral program, this means the Education women have less time to build that long-term commitment with their faculty advisor. The nature of the Education women's commitment to their dissertation advisor is limited to formal meetings, virtual feedback on dissertation drafts, and the interaction is isolated to dissertation-related activities. The relatively superficial nature of the Education women's relationship with their dissertation advisor may in part explain the Education women's fewer positive doctoral experience and more challenges to degree progress.

Theme 2B: The quality of the doctoral experience and degree progress was entirely dependent upon personality, work style, and research interests of their advisor. Those women who had the most positive experiences and timely degree progress said it was a matter of "luck" to find an advisor who provided all three types of support – technical guidance, emotional support, and career-related advice.

The 10 Education women and the 11 Engineering women discussed how one's faculty advisor could "make or break" the doctoral experience and one's degree progress, and how the faculty-advisor relationship varied widely, depending upon the individual personality, work style, and research interests of the faculty advisor. One woman in the Engineering focus group confirmed this sentiment among the NIES Engineering women.

> It is like your experience is almost entirely dependent on what the personality of your advisor is like and you – I mean if you have a good advisor or you have someone who matches with your personality and your research talent, that's great. If you don't, that can be really problematic, but it's really, really dependent on who your professor is. – NIES Focus Group

Rachel, a 6th-year NUES doctoral student, also talked about how "lucky" she was to find an advisor who truly supported her professional and personal success, but Rachel switched to this advisor after experiencing an advisor whom she did not consider a mentor.

> So my [first] advisor was a very famous professor, and while a very nice person but completely incompetent when it comes to supporting mentoring and all that kind of stuff. So I switched to my current professor, like my research guide, who I do research with in my fourth year. . . She is amazing. . . I would say that she is a true mentor. . . I feel really lucky, really, really lucky. . . . I have received a lot of support and I think my relationship with her [advisor] and also my other committee member . . . has been so good to me. So I've been really lucky, I don't think that's an institutional thing, I think that's obviously anomalous.

Rachel is just one example of a woman who had a very positive experience with her advisor and thinks that her positive experience is not the norm. There were a few other women who were highly satisfied with their advisor relationship who used the word "lucky" to have an advisor who provided the three types of support – technical/academic guidance, emotional support, and career-related advice – that are considered necessary for quality faculty advising (Tenenbaum, Crosby, & Gliner, 2001). Rachel felt like her advisor provided her the technical, emotional, and career-support that she needed. Rachel's perceived that her advisor treated her as a colleague, and this mentorship was the encouragement Rachel needed to complete her degree in six years, one year before her peers in her cohort.

Both the Education and Engineering women mentioned feeling "lucky" to have a supportive advisor who provides not only technical, but also emotional encouragement for completing the dissertation. Madelyn, an Aeronautics and Astronautics Engineering student shared,

> I mean because I want to finish and so it helps to have someone who is prudent and who wants me to finish the remaining things, administrating and who is helping me do all that, encouraging me and is not presenting obstacles that would stop me from graduating. So yeah, I guess I would say I've been lucky to have an advisor who's been supportive like pretty much every step of the way.

Receiving that emotional support was especially important for Nicole, a fifth-year NUES student at the dissertation proposal stage of her doctoral program. Nicole said she needs both academic and emotional support, sharing,

> [My advisor], she is wonderful in that I have needed a lot of emotional support as well as academic support, I'm not very good at separating the two . . . she has been really good at providing emotional support and academic support . . . she is very good at the politics of NUES . . . she gives me a lot of good advice around picking the committee members…. how I would structure research, what kind of methods would be the most fruitful as well as be the most palatable.

The career guidance and support received from advisors was a major difference between the Education and Engineering fields. The Education women I interviewed said their faculty advisors treated them very differently depending upon whether they planned to pursue a career in academia. Those Education women who didn't plan to pursue a career in academia felt their advisors couldn't or didn't provide them with career guidance about the alternatives to a traditional academic career. Brenda, a sixth year NUES doctoral student studying Human Development, said she felt she didn't have anyone who could help her career-wise, sharing:

> Well technically on paper I did [have an advisor], but it was somebody who had clearly had no interest in putting much effort into talking to me . . . So, it left me in this position, where I really didn't have anybody to go to. . . . I had people that I was talking to, but nobody felt obligated to find me jobs and sort of support me in certain ways.

Brenda eventually did find an advisor who was the PI on the research project she became involved with. While she is now satisfied with the type of relationship she has with her advisor, she realized she needed to change her expectations about the kind of career guidance and support she would receive, given that she did not wish to pursue and

academic career after finishing her doctoral degree. Originally, Brenda expected her advisor to invest in her professional development, regardless of her future career path. However, Brenda soon realized that her advisor was only going to invest his somewhat limited time in those students whom he saw as future academics. She reflects,

> I am definitely not a superstar, but I do feel like we have a solid relationship. . . I am not going to be an academic necessarily. I don't think he is sort of evaluating me for future… collaboration that he would do with the people that he sort of sees as superstars, but I think that he also sees things that I can do that he values in a different way.

Brenda has come to terms with her relationship with her advisor, and she realizes that there are some things that cannot be changed. Similarly, Marie, a third-year NUES student expressed similar sentiments that both of her advisors, one for coursework and another advisor who is well-connected in the Higher Education field, couldn't provide her with the type of guidance needed.

> I think they both know what I want to do but I wouldn't say that they've given me any sort of specific career advice or help. Maybe because I'm too young as a doctoral student to do that or maybe because they know how to become faculty members and I don't want to be a faculty member, so I don't… I'm not sure."

This uncertainty or disinterest in pursing an academic career was common among the NUES women; six of the 10 NUES women either expressed uncertainty or definitely did not want to pursue faculty careers upon completion of their degrees, and so Brenda and Marie's experiences with their advisors is typical of most NUES doctoral student non-academics –NUES faculty could only provide guidance about how to become a faculty

member, and if NUES students want to work in administration, consulting, or policy, they were left to their own devices to network and find short-term and long-term career opportunities. Knowing that the majority of doctoral students don't want to pursue academic careers, it would behoove the faculty and administration to look into hiring faculty (tenure-track and non-tenure-track) who have previous experience in educational administration, leadership, instruction, or policy prior to coming to the faculty.

Unlike the Education women, the Engineering women were satisfied with the type of career advice they received from their faculty advisors/PIs, regardless of their intended career path. Engineering is a field where the majority of doctoral students decide to pursue in industry as opposed to academia. Because it is common for the faculty to have multiple years of experience as Engineers prior to pursuing an academic career, the faculty advisors are much more supportive of both academic and industry career tracks. The majority of the 11 NIES women were unsure of which track to pursue, but their faculty advisors, many of whom had worked in both academia and industry, were able to provide them specific advice and guidance for each career path. Katherine, a second-year NIES student studying Biological Engineering, shares. "[My advisor], he is really good about that, like he tells it like it is, but he is very good about telling you what you need to do if you want to be a professor, or if you want to go into industry." The NIES women mentioned that their faculty advisors tailored their advice to each student, depending upon the student's career goals. The advisor was the primary reason that Danielle, a fourth year doctoral student in Environmental Engineering, decided to stay and pursue the doctoral degree during periods of doubt. Danielle had this to say about her advisor of three years:

> He does it all. So he does the courses, he does the research, he does the professional development, bringing in the speakers, et cetera . . . I'd say if it weren't for him, I would not have stayed. He was a major, major push to stay because; a) I was very lucky to have such a great advisor. And secondly, his knowledge and his experience are just amazing and I have still so much more to learn and just the ability to learn from him is just going to be a great asset to me.

The knowledge and experience of her advisor that Danielle refers to is both academic and practical experience in the industry. Danielle's experience is very common for the NIES women; many of them talked about how their advisors provided all three types of support, the most important of which is the career guidance. Both the Engineering and Education women who were highly satisfied with their relationship with their advisor belie believed they were "lucky" and that having a positive relationship with one's faculty advisor was certainly not the norm.

Theme 2C: Some women struggled to find meaningful relationships, due to their advisor's lack of availability, communication, and investment in their advisees' success.

Whereas some of the previously mentioned women reported extremely positive relationships with their advisors, other women struggled to form meaningful relationships with their advisors due to the advisor's lack of availability, poor communication, and limited time to spend advising their students. Sally, a third-year Environmental Engineering doctoral student, talked about the difficulty of communicating with her advisor, due to his busy schedule which meant he traveled a lot. She would often go a

couple months without meeting with him or he would cancel advising meetings with her, which strained the advising relationship Sally shared,

> So he does this thing every now and then where he'll schedule a meeting and then he'll either cancel it at the last minute, just won't show up which, you know, I don't think he does necessarily on purpose and it can be…frustrating.

Because of her advisor's limited time, Sally says she has trained herself to troubleshoot issues she is having with her research data herself. Even though she wants her advisor to be more available and provide guidance about research decisions made in the lab that will ultimately benefit her professional success, Sally realizes that her advisor has a limited amount of time and that is something that she cannot change.

> I can't just automatically make the assumption that my advisor is always going to be acting in my best interest, not because I don't trust him to act in my best interest or didn't want him act in my best interest, but . . . I don't trust him to actually be capable of realizing what my best interests are when there is thousand other things that he is thinking about at exactly the same time. I know that this is the way it is, that he's a very busy man, that I'm not going to get as much of his time as I'd like. And so I'm satisfied because there's all these other advantages because he's very good . . . technically . . . he has a lot of influence. I'm really happy with my relationship and the things that I'm unhappy about I know can't be changed. I've been trying to train myself to sort of, you know, get used to that and not meet with him very much. And that's actually, I think, really good for me from a development point of view, because it forces me to be independent.

Overall, Sally has adjusted her expectations so that she no longer becomes disappointed when her advisor cannot meet with her as often as she would like. She has adjusted her approach to her research to problem solve on her own and accept the things about her advisor that she cannot change. Because she has adjusted her expectations, Sally expresses she is satisfied with the advising relationship because she does benefit from the advising relationship. For Sally, the quality of the technical advice and professional status and influence her advisor gives her is more important than the amount of time he gives her.

Sally's uncertainty about her relationship with her advisor was not the norm for the women at NIES; most of Engineering women I interviewed were highly satisfied with how their advisors treated them, and this was a function of the intentional nature of the faculty advisor matching process which aimed to match students and faculty with similar personalities, work styles, and research interests. Another reason the NIES women were so satisfied with their advising relationship is that their faculty advisors simultaneously fulfilled the role of academic advisor and research supervisor as the PIs in the research lab; thus there was a dual relationship – the NIES women could ask for academic guidance, research project guidance, and career guidance all the same time. In Sally's case, she was one of the only NIES women who said her faculty advisor was not available to provide that academic and/or technical guidance she needed in the lab**,** but yet, Sally was able to see her advisor in a positive light. This was because she received the support and guidance she needed from the advanced peers in her lab, which compensated for her faculty advisor's lack of time and availability. Often, advanced peers were able to fulfill that advising role in the faculty advisor's absence for more junior

doctoral students who struggled to form beneficial relationships with their faculty advisors.

It was especially common for the Education women at NUES to struggle to form meaningful relationships with their advisors, and this was even the case for the four NUES women who planned to pursue academic careers. Even though Elizabeth, a seventh-year NUES doctoral student in the dissertation data collection phase, plans to pursue an academic career, she did not believe her advisor was truly invested in her professional success. The mismatch in research interest and lack of personal encouragement were reasons Elizabeth gave for why she was dissatisfied with the quality of her advising relationship and didn't think her advisor was really invested in her personal and professional development. She reflects,

> I think that I would be happier if I had an advisor who is directly in my area, who I can go to conferences with, who would introduce me to people, and how certainly I pass through my career. But I don't think . . . that in the course of my life, she is not my greatest mentor because I don't feel like it's been that kind of a relationship, you know what I mean. I feel like she did what she needed to do.

Elizabeth felt that her advisor "did what she needed to do" in terms of providing her with the technical guidance to finish writing her dissertation. However, her advisor was discouraging of Elizabeth's personal decisions and did not provide the networking help that Elizabeth perceived was critical for developing her future academic career. In hind sight, Elizabeth said she thought about changing her advisor but she said there was a dearth of faculty whose research interests matched hers and she had already invested six years of time in developing the relationship when she originally enrolled at NUES as a

master's student. Thus, it was too late in the dissertation writing process to switch advisors.

Both groups of women agreed that the faculty advisor can either "make or break" a doctoral student's trajectory for completing the doctoral degree. Ultimately it comes down to nature of the matching process and the "luck" about who one's advisor is. In Education, the matching process was very flexible, and it was common for the NUES women to have one advisor for their dissertation and a faculty supervisor for their paid work as RAs or TAs. In Engineering, the faculty advisor and the primary investigator in the lab is the same person, so the faculty member serves a dual role as both dissertation advisor and research lab supervisor. Both the Education and Engineering women mentioned how "lucky" they were to find an advisor who provided technical, emotional, and career-related support. The quality of the faculty advisor relationship was a critical determinant of the type of doctoral experience and how quickly the women progressed through their doctoral degree programs.

Theme 3: Peer Support is Critical

Peer support was the most important facilitating factor for degree progress for both the Education and Engineering women, but the catalyst for this peer support differed. Whereas the Education women said their peer support was student-initiated, the Engineering women said their peer support was initiated and facilitated by the department and/or lab. The structure of the dissertation research process differs between the two fields of Education and Engineering and in turn differentially shaped the peer environment and the frequency of peer interaction. Both Education and Engineering doctoral women named their peers as the single most important source for facilitating

degree progress. However, Education women mentioned that they only developed these critical peer relationships during the coursework phase of the program. The dyadic nature of the research assistantship and the solitary qualifying exam and dissertation phases of their doctoral program did not facilitate much interaction with many peers or other faculty besides their assistantship supervisor and dissertation advisor. The Education women relied on administrators to keep their degree progress on track. In contrast, the Engineering women developed their relationships with peers, specifically advanced doctoral peers, and faculty from the very first semester, and this collaborative research environment continued throughout the dissertation phase of their doctoral programs. Engineering women also mentioned the importance of departmental administrators for keeping their degree progress on track.

Theme 3A: The isolating nature of the research structure in Education provided fewer opportunities for peer support which in turn inhibited degree progress for the Education women.

For the Education women at NUES, the nature of the assistantship experience not only made the doctoral experience isolating, but this isolation inhibited the women's degree progress. The women enjoyed the coursework phase of their doctoral programs because it was the time when they were most engaged with the faculty, their peers, and the overall departmental environment. When the women were not in class, the remainder of their doctoral experience was spent working as a research assistant or teaching assistant for a NUES faculty member. Not only were the NUES women working many hours as research assistants on projects unrelated to their dissertations, but also did these activities – mainly studying, writing, conducting research, and grading class assignments

– alone, which made the doctoral experience after coursework feel isolating. Marie, a third-year NUES doctoral student expressed this sentiment:

> I mean I think just feeling – the feeling of isolation, the feeling of like not having close friends . . . I think it's like my personality maybe as an extrovert that I need to have sort of energy around me from other people and I can't sit in a library all day by myself and feel satisfied with my life.

During the dissertation development phase of their doctoral program, the feelings of isolation heightened for the NUES women, partly because the process of writing the dissertation is a very solitary activity and also because once coursework was finished, the women primarily interacted with only one advisor or another faculty member. The dyadic apprenticeship-like dissertation research process at NUES, which is typical of many Education doctoral programs, did not facilitate frequent peer interaction and strong peer support to enhance degree progress.

The only time when doctoral students at NUES collaborated together was when they took the initiative to gather informally to form writing groups. These writing groups were informal gatherings in which the NUES doctoral students convened to write portions of their dissertations for a designated amount of time. In the Education focus group, one woman talked about how her writing group was helpful for degree progress because it provided a structured opportunity for her to receive feedback from her peers about her dissertation writing. She shared, "I had classes with people I liked and respected and felt comfortable with. We decided then. . . . it would be something useful to do and so then we did and everybody that I know who, would make progress are people who have groups" Nevertheless, these informal structures for peer interaction,

including writing groups, were initiated by the students based on the examples set by more advanced doctoral peers. The women in the focus group mentioned that the only way they learned about these opportunities was through informal networking with more advanced doctoral students in earlier cohorts. These opportunities for peer interaction were not part of the formal doctoral department and program structure.

Theme 3B: The collaborative nature of the research lab structure in Engineering provided more opportunities for peer support for the Engineering women which in turn helped facilitate degree progress.

The NIES women attributed their positive doctoral experience and degree progress to the collaborative nature of the research lab structure and environment. Engineering doctoral students at NIES take on research assistantships as early as the first semester where they are assigned to a research lab of doctoral students, post-doctoral students, and faculty. The research they conduct in the lab serves as the basis for their dissertation, and so women start working on their dissertation research in the lab alongside their peers. Whereas a separation exists between the research assistantship projects and the dissertation research for the NUES women, at NIES, the 40-50 hours per week that the NIES women spent on their research projects and on their own dissertation research blended together. Thus, the particular lab is the primary locus for peer interaction, and each lab has its own culture. Maureen, a third-year Engineering student elaborates that "each person's lab – each professor's lab has a particular lab culture and a kind of varies depending on the post-doc-grad student ratio, how many people are in the lab in total and where – what the focus is whether it's kind of a more basic science focus or more industrial focus."

The culture of the lab is almost entirely shaped by the personalities of the doctoral students and post-doctoral students in the lab. The lab culture is integral to a doctoral student's experience because it serves as the primary locus for peer socialization – doctoral students in each lab live, work, eat, and socialize with other doctoral students both inside and outside of the lab. Whitney, a seventh year doctoral student who graduated last year, used the word "community' when describing her lab's peer culture. She shares,

> Well, I would say that the community has been really helpful actually. Just the fact that everybody sort of cares about everybody else and the people's lives. . . things like that make it a pleasant place to be. So I feel like that has helped. I have never come to a point where . . . I just don't want to come to work [in the lab] at all. I feel like I've got a bunch of really great peers who are also my very good friends now.

The Engineering women mentioned the importance of their lab peers, specifically more advanced doctoral students, as helpful sources of support for their degree progress. When the doctoral women had questions about their own research or faced challenges in the research lab with their experiments, they often approached the more advanced doctoral peers, specifically the post-docs, to ask for help. Heather, a third-year Aeronautics and Astronautics Engineering student, said asking peers is,

> How you get through . . . by having those people there helping you and that their resources which you need help and they're definitely like my first point of [contact], even sometimes like if I'm stuck on something, I'll go and knock on someone's door and be like hey, can I talk you through this and can we try and

> figure out like why my brain isn't working… I definitely appreciate being able to have people around me.

The communal and supportive culture that the lab structure helps shape helped facilitate the NIES doctoral students' degree progress because they had could encourage them to keep moving forward with their dissertations. Susan, a seventh-year doctoral student also in the Aeronautics and Astronautics department said these advanced peers were crucial in motivating her to keep pushing forward.

> The ones who just finished their PhDs within the last year that was critical. And being able to ask them question every time I turned around was enormously useful. That's sort of what we're trying to recreate now with all these new students realizing that, having an office setting where we're all in the same room either in the lab or the office, and having them right there to ask questions for me was beneficial.

Susan's description is just one example of how the physical structure of the office or the lab is such that doctoral students' workspaces are located next to one another in the same room. This lab structure provides collaborative environment for peer support of individual and group research.

Not only did the Engineering women receive peer support from their research labs, but also from graduate student organizations at Northeast Institute. The NIES women mentioned that these organizations were an important factor that helped their degree progress. These organizations provide a microcosm for building community among the master's and doctoral students, both within NIES and also institution-wide. The women mentioned that they were involved in club sports, musical and theatre

ensembles, and other affinity groups, and these groups served as outlets for coping with stress and helped them maintained a balanced work and personal life. Danielle, a fourth-year Environmental Engineering doctoral student talked specifically about her ice hockey club team as

> a really great community of women that's outside of like [classes]. . . So like I really enjoyed hanging out with them, I'm active in my residence community and it's like they have fun like in terms of opportunity, like you can learn anything you want here, so I learned how to sail, I learned how to row, I'm learning how to play hockey."

Many of the women in the Engineering focus group either mentioned that they founded or were actively involved with women-centered graduate student organizations in their doctoral departments which were important sources of peer support for degree progress. These women-centered groups met regularly and sponsored professional development workshops focusing on how to become a professor, and brought in prominent Engineering alumnae who have excelled in both academia and industry to speak to the Engineering master's and doctoral women about their success stories. The many outlets for peer support, both institutional and department-specific, have enabled the NIES women to openly and frequently engage with women peers, faculty, and Engineering role models to build a sense of community not only within the department at NIES, but also externally in the profession of either academic or industry Engineering.

Theme 4: Different Cultural and Structural Challenges

Education and Engineering women identified different factors that challenged their degree progress, and these factors were inherent to the culture and structure of the department and doctoral program at NUES and NIES, respectively. Even though the Education and Engineering women identified similar supports for facilitating their degree progress, the two groups experienced differing challenges. Most of these challenges were related to financial support and the faculty advisor relationship previously discussed. However, both groups of women mentioned additional challenges which reflected the individual departmental and doctoral program culture and structure within the two fields. While the Education women identified the doctoral degree committee review process and lack of daycare as challenges, the NIES Engineering women identified uncertainty about career prospects for PhDs in Engineering and societal sexism as their barriers to degree progress.

The Education women who had either defended or submitted their dissertation proposals mentioned the Doctoral Degree Committee (DDC) review milestone as a major "hurdle" to jump over in the course of their degree progress. The Doctoral Degree Committee (DDC) is a group of tenured faculty members representing several different departments across the University whom review all doctoral dissertation proposals in order to determine whether they are worthy for fulfilling the requirements to be granted a doctoral degree by the university. As one woman from the Education focus group put it, the DDC is "they're literally a bunch of people usually un-tenured faculty members who are trying to make a name for themselves, they don't know anything about the subject." The DDC committee and review of the dissertation proposal is an entirely separate and

additional milestone to the oral defense that NUES doctoral students must complete in front of their dissertation committee of three or four faculty. The women talked about submitting changes to both their dissertation committee and the DDC for supplementary review. As a result of this dual submission process, conflict can occur when the feedback doctoral students receive from DDC is at odds with that of their dissertation faculty committee. One woman in the Education focus group said the DDC was the reason she almost quit her doctoral program, sharing:

> I would actually say, I almost quit the program after what happened with the DDC . . . It's supposed to be a quality check because there is so much variance in terms of the expectations across [departments]. . . so literally the DDC can say change 8 things, you say, okay, your committee says 'fuck that' which is what happened with me and I said I'm going to change these things. No, no, no, I said I'm going to change these things. DDC said, okay great . . . I did everything my [dissertation] committee wanted because at the end of the day, they're the ones who approve my dissertation so why did I go through that exercise in the first place, Because they don't know one fucking thing about the thing they're supposed to be evaluating.

The faculty members who sit on the Northeast University DDC are often not from the same professional discipline or field as the faculty who sit on the dissertation committee for the NUES doctoral dissertations. Thus, the doctoral women who were at the dissertation proposal stage or beyond mentioned that they often had to go back and rewrite sections of their dissertation proposal or write an addendum to respond to the DDC's feedback and/or concerns. This takes additional time and effort which precludes

doctoral students from immediately collecting data after the dissertation proposal is approved by their dissertation committee.

Another challenge, mentioned by all four of the 10 Education women interviewed who had children is the lack of child care accommodations and centers on campus for doctoral students who are mothers or fathers of young children. Of the four Education women who had children, three of the four had children between ages 1 and 6, and Louisa had a son who was age 12 who was in school most of the day and also stayed after school to participate in activities until she could pick him up. Thus, most of the women said their children required care during the day since they were too young for full-time school. Elizabeth and Brenda either arranged for daycare with a relative or stayed home with their children during their doctoral program because they couldn't afford to have daycare. Elizabeth a seventh-year doctoral student and mother of a four year old said,

> I couldn't afford daycare and there isn't one offered at the school whereas a lot of schools do have that. Even you know, a lot of schools have labs, I actually wished this school had a lab daycare, because that would be really convenient.

As a result, Elizabeth stayed home during her third year in the doctoral program when her daughter was born to raise her, and this decision pushed Elizabeth's degree progress back by one year. Louisa, a single mother of a 12-year old, did not experience as many challenges since her son was in school all day and then participated in after school activities until 4 or 5pm, so she could devote a full eight hours to full-time study before picking up her son after school.

Elizabeth is just one example of how Education doctoral women mothers, many of whom had partners who worked full-time jobs, were deemed primary responsible for

caring for their young children at home while simultaneously trying to be full-time doctoral students. Each of the women said they would have taken advantage of an affordable on-site day care center if it was available because it meant they could work on their research or go to class knowing that their children were safe and conveniently cared for on campus. Rachel had a full-time nanny to take care of her 1-year old twins while she was at school and her husband was at work, and so the only reason Rachel was able to afford full-time daycare was because her family paid for it. Having a nanny enabled Rachel to spend multiple hours on campus so she could continue to teach her classes, have meetings, and work on writing up her dissertation. Rachel said that without having a nanny, she wouldn't have been able to finish her dissertation the following year after giving birth.

Childcare was never mentioned as a barrier for the Engineering women because none of them had children. Although four of the 11 Engineering women were in cohabiting relationships or married, none of them even considered having children while in graduate school. The reason for this might be that Engineering culture at NIES is such that the expectation for Engineering doctoral women (and men) is that they "dare not" have any children while in graduate school if they want to be successful doctoral students. This underlying expectation reflects the very much masculine attitudes common in Engineering doctoral culture, as well as Engineering professional culture, that having children is not appropriate. A deeper analysis of what this means and how the Engineering culture sustains the normative gender schema of masculinity is provided in the next chapter, Chapter Seven.

Another challenge expressed by the Engineering women was uncertainty about the prospective career paths for Engineering PhD students. Since Engineering, like Education, is a field which involves both the study and practice of Engineering, the women were concerned whether they would be pigeon-holed into only academic jobs and excluded from consideration for jobs in Engineering industry with a PhD. Danielle, a fourth-year doctoral student in Environmental Engineering intending to return to Engineering industry attended a career fair for graduate students in her sub-field and felt discouraged by what the Engineering employers told her.

> So I had more than a few people tell me that if I had a PhD, I would only be qualified for a very specific type of job, a research position or something to do with the numerical modeling, nothing practical, nothing hands on, nothing field oriented and that was where all my experience and all my training have been to this point . . . that was very, very discouraging and I – as I said I almost quit and spend many, many months carefully thinking about this. . . And I guess what really decided for me was someone said to me, do you really want to work for those companies who have that opinion on PhDs? And the answer was no.

Most of these employers preferred students with a master's degree because the assumption was they would be best qualified for careers in industry. About half of the 11 Engineering women were considering careers outside of academia in government or privately-funded research, industry, or policy. Elaine, a fourth-year doctoral student studying Material Science talked about the uncertainty of pursuing a career in academia. She shared,

> I am feeling like at this point I am really kind of not wanting to go into academia. . . maybe it won't be any better in any other field, because everything has its annoyances, but I mean, it's very competitive in academia. It's hard to get a job that pays as well. It's like you are working so hard and you are fighting so hard for these things that are, maybe not there.

Elaine said some of her former post-doc colleagues in her research lab applied to many jobs and were unsuccessful, and that was just last year. In fact, another Engineering woman, Madelyn, finished her doctoral thesis in August 2012 and took the bar exam immediately after because she decided to accept a full-time job as a researcher-lawyer at an intellectual property law firm. Madelyn said that this career path gives her the opportunity to combine both her law and science background.

The last factor that some of the NIES women cited as problematic for their degree progress were the subtle, but still sexist views of society about women as Engineers. This was particularly the case when the women worked on practical industrial projects funded by governmental and state organizations. While working on these projects, some women experienced subtle, but still sexist jokes from male Engineers, especially military personnel. The women talked about how they had to make sure they were on their game because the men were surprised to see a woman from the NIES research team working on a high-level Engineering project. One woman in the Engineering focus group talked about how they let these jokes slide off their back because the most important thing is to focus on the work to be done, saying

> Well in the field of Engineering I'm kind of used to it, but it's still annoying, but I kind of think that [the sexist jokes] honestly are implied. I guess I'm used to it

> now and I just – I'm going to go with it, but if there were not those things I would probably like appreciate that.

The NIES women also mentioned that they were conscious to ensure that their outside clients perceived them as competent as their male doctoral student peers, but the women were quick to point out that they experienced sexism only when consulting with clients in the Engineering industry. The Engineering women felt they were equally treated and supported by both their male and female faculty at Northeast Institute.

Only one of the 11 NIES women, Sara, mentioned an experience when she experienced institutional sexism as the only female doctoral student teaching assistant in her department. Sara said her competence as a TA was constantly questioned by her mostly male undergraduate students, and the institution left her name out of the teaching award announcement, and when they corrected the publication, they referred to her as a "he" instead of woman. However, Sara's experience was very unique and atypical, considering every other Engineering woman mentioned that NIES as an institution was incredibly supportive of women's success. Overall, the Engineering women did not perceive that sexism existed or was problematic within Engineering doctoral culture or professional culture, probably because most of them were unaware of the ways in which the doctoral culture in Engineering reflected and reinforced masculine definitions for success. On example of a masculine definition for success is the NIES departments' expectation that Engineering doctoral women "dare not" have children while in graduate school. A more detailed analysis and discussion of how the "masculine" Engineering culture impacted the doctoral women's experiences and degree progress can be found in Chapter Seven.

In sum, the Education and Engineering women experience different challenges to their degree progress. The Education women were most concerned about the doctoral degree committee review process and the lack of childcare for doctoral students, whereas the Engineering women were most concerned about their career prospects after earning their doctoral degree and the societal sexism they experienced. These challenges are a direct reflection of the culture and structure of doctoral education within two highly gendered fields, which in turn are shaped by gender schemas (Valian, 1999). The next chapter, Chapter Seven, addresses the three research questions that guided this study, including the specific ways in which doctoral education culture and structure is gendered how these gendered environments differentially affected women's doctoral experiences and degree progress in each field.

CHAPTER SEVEN: ANALYSIS AND INTERPRETATION

In the last chapter, I presented the four major themes that emerged from the individual interviews and focus groups in order to compare and contrast the nature of women's experiences and degree progress in Education and Engineering. In this chapter, I provide a feminist analysis and interpretation of the culture and structure of doctoral education in Education and Engineering using Valian's (1999) concept of "gender schemas" to explain how these gendered environments contribute to both commonalities and differences in women's doctoral experiences and degree progress in the two fields. Specifically, I provide the answers to the three research questions that guided this study:

1. What is the gendered environment of doctoral education like for women enrolled in doctoral programs in Education, a prototypically "female" field, and Engineering, a prototypically "male" field?

2. How do the experiences of women enrolled in doctoral programs in Education and Engineering influence their doctoral degree progress?

3. How does the support for and barriers to women's doctoral degree progress in Education compare to the support and barriers to women's degree progress in Engineering?

A Gendered Perspective of Doctoral Education Culture and Structure: Gender Schemas at Work

In order to understand how the culture and structure of doctoral education is gendered, I remind the reader of the important role that gender schemas play in shaping the gendered environment of doctoral education. As I mentioned in Chapter Two, gender schemas are the sub-conscious hypotheses that society forms about the differences

between males and females that ultimately shape their beliefs and expectations of both men and women as professionals (Valian, 1999). Valian makes the point that both men and women develop the same gender schemas during early childhood, and that they are based on the sexual division of labor inside and outside of the home. The result of these gender schemas is that women's' performance and evaluations are often underestimated because their performance is associated with the feminine traits necessary to fulfill their roles traditionally within the home, and men's performance and evaluations are overestimated because their performance is associated with masculine traits necessary to fulfill their role as the breadwinners outside of the home. Thus men's performance, similar to working outside of the home, is overvalued and women's performance, like working inside of the home, is undervalued by society.

Because the Education and Engineering professional cultures often require masculine traits and characteristics to be successful, and doctoral education is a formalized way for doctoral students to become socialized into these (often academic) professional cultures, gender schemas can be applied to doctoral education to understand how and why doctoral education reflects and perpetuates masculine schemas for success in Education, a prototypically feminine field, and Engineering, a prototypically masculine field. I begin this chapter with identifying the gendered culture and structure of doctoral education in both Education and Engineering.

RQ1: What is the gendered environment of doctoral education like for women enrolled in doctoral programs in Education, a prototypically "female" field, and Engineering, a prototypically "male" field?

The gendered environment is defined as the extent to which the culture and social structure resembled traditionally masculine or feminine ways of organization or functioning. The culture of doctoral education in both Education and Engineering emphasizes the values of proactivity, independence, and competition, which represent the schemas common of masculinity. Doctoral education was also described by the women as flexible and collegial, which reflect feminine gender schema (Bem, 1981; Valian, 1999). Specifically, the women perceived doctoral education culture as inconsistent because it simultaneously emphasized both independence and competition, reflective of masculine gender schemas, and flexibility and collegiality, reflective of feminine gender schemas. Many of the Education and Engineering women struggled to reconcile these two conflicting gender schemas within the doctoral environment which resulted in both groups sharing that the culture of their doctoral department and program was not a supportive environment for degree progress.

Proactive

The doctoral women in Education and Engineering described their perceptions of the culture of doctoral education in their departments and programs as one that that requires students (both women and men) to be proactive in order to get the support and resources they need to be successful. The women didn't expect there to be any hand holding throughout the doctoral process and were on their own to find opportunities to benefit their experience, degree progress, and future career prospects. In the Education

group, proactivity took the form of entrepreneurialism. Rachel, a sixth-year student described this entrepreneurial atmosphere as one in which "you spend most of your time independently I would say to a large degree trying to find opportunities . . . to create opportunities that's why I said entrepreneurial. I think the positive to that is that you have more flexibility in terms of figuring out things you're interested in and can do lots of different things. The negative is it's not necessarily supportive." The opportunities that Rachel was referring to were opportunities to gain the necessary experience doing research, teaching, and perhaps consulting in order to advance their dissertation research and prepare them for a career after graduation. Some of the women believed that NUES' approach and culture is entrepreneurial because Education students have the flexibility to pursue a variety of interests, but yet there are no formal mechanisms of institutional support. For example, the faculty are not forthcoming with sharing information about the available opportunities for advancement unless the doctoral students proactively seek out the faculty member.

Similarly, the Engineering women also expressed the same expectations that there would be no hand holding by faculty advisors to navigate through the doctoral process. One woman in the focus group said that "You're here, it's an independent program, and you need to be proactive and independent and go and ask questions and you're here for you and then people here will help you, but you need to know how to navigate that". This is an example of how doctoral students learn to take responsibility for their own learning, navigate the doctoral education system and leverage available institutional and departmental resources to achieve their goals. Without that initiative, it is easy to get a

lost. Susan, a seventh-year Aero-Astro doctoral student, said that especially in her department,

> You can get lost between the cracks easily unless you stick your foot out and make a place for yourself, and being a woman you would get lost. And I think it's easier for one to get lost unless they are proactive. And being proactive, making your own culture, and making your own friends, making your own experience is critical.

Susan talked about how transitioning to that mindset of taking control and being proactive was particularly difficult after her undergraduate experience where much of her learning experience was created for her. Susan is an example of the typical NIES doctoral student who enrolled in an Engineering doctoral program after graduating from college. Thus, for most Engineering doctoral students, their doctoral departments and programs are the only professional environments they have ever worked in, so for many of these Engineering doctoral students the transition from an undergraduate environment in which their learning is dictated by specific projects and deadlines which are externally imposed, to a doctoral environment in which that learning is more self-directed and autonomous can be disconcerting for these students; however, this proactivity is expected as part of the doctoral culture.

Highly Independent and Flexible

Both groups of doctoral women also used the word, "independent" to describe doctoral education culture in their respective fields. When given ultimate independence, the women were not sure what to do with it since the nature of their education up until this point had been so structured. For the first time, the women were solely in charge of

crafting their educational and professional trajectory. Other than a few required courses, the women were given a lot of independence and freedom to craft their own doctoral program coursework, decide when to take their qualifying exams, and choose their dissertation research topics. Some of the Education women embraced this flexible structure, as it meant they had more freedom to tailor their doctoral education to their unique interests, passions, and career goals. Laura, a third-year Education student said at NUES, she had

> the freedom even if people weren't doing exactly what you wanted to do . . . if you were really persistent and if you were . . . proactive, you could kind of piece things together and make it happen for you but there is the freedom. The degree . . . there aren't so many requirements that you are narrowed into like really studying one particular thing.

Laura said that she liked the idea of having the opportunity to explore many opportunities that interested her instead of conforming to pre-established lock-step requirements. In fact, the Education doctoral program only requires three courses – a pro-seminar for first-year doctoral students and two research methods courses.

Similar to Laura, Alicia, another Education doctoral student, mentioned that the autonomous culture and flexible structure of the doctoral program was something that has been critical to her degree progress and success thus far because she has been able to progress in the doctoral program at her own pace and on her own terms. Alicia shares,

> I can take classes in any school that I want to and I can design my own program. And so that is extremely helpful for my success and I think and I know that's

> what has allowed me to come as far as I have. . . The flexibility and in my mind it's all part of the same theme of [NUES] treating you like you are an expert.

As a doctoral student beginning her third-year of the program at the time of her interviews, Alicia had just finished her qualifying paper and was starting to work on her dissertation proposal even though she had a few more courses to complete. In short, Alicia appreciated that the doctoral program didn't tell her what to do; she also thrived because she was in control – she could craft own intellectual path and explore what interests her instead of having to take courses on topics that didn't.

Similarly, the Engineering women embraced the autonomy they had in shaping the course of their doctoral study and also used the word "independent" to describe the nature and structure of their doctoral programs at NIES. Engineering doctoral programs at NIES centered around research rather than coursework. Typically, most doctoral students take just one year of coursework; the majority of their time in the doctoral program is spent conducting independent research in the lab. The Engineering doctoral women had the flexibility to take charge of their own dissertation research from the very beginning. One Engineering woman from the focus group commented, "When you join the PhD program, so you start with some classes, but pretty soon you're going to have your own project and you're kind of responsible for accomplishing the goals eventually. And then you have to be the leader of your project." Getting results in the lab was not necessarily deadline-oriented – obtaining usable results would depend upon the research questions they were seeking to answer. The flexible structure of the doctoral program, according to one NIES doctoral student, Maureen, allows doctoral students the freedom to "find your own way to be successful." For the women who enjoyed learning at their

own pace and designing their own doctoral program, this flexible structure created an environment conducive for timely doctoral degree progress.

Inconsistent: Collegial and Competitive

Both the Education and Engineering women described the culture of doctoral education in their respective fields as inconsistent. Many of the women were struggling to reconcile the tension that existed between collegiality and competition in the culture and structure of their doctoral programs, which reflected traditionally masculine and feminine gender schemas, respectively. On the one hand, some of the Education women said the NUES culture was incredibly collegial – that is, the doctoral students and faculty would share information and willing provide advice or feedback about class assignments and ideas and methods for dissertation research. Some NUES women mentioned the peer environment as especially collegial. Laura, a third-year student studying Educational Policy shared, "I think it's [NUES] a pretty warm place, like I definitely feel that people are supportive of one another and are pretty friendly. It's not like hypercompetitive". Specifically, many of the NUES women mentioned that they perceived this peer collegiality as a community, and many women relied on more advanced peers for help, and this created a sense of community for the NUES women, Louisa, a third-year student studying Higher Education expressed this sentiment, sharing "The sense of community is really strong here, people are really, really nice . . . they're really generous, they're really sort of forthcoming with their help." Those same women who described the peer environment as collegial also believed that the faculty treated them more like colleagues rather than apprentices in training.

Similarly, many of the NIES women described the culture of the lab one in which doctoral students were willing to guide and mentor one another about the doctoral experience and process. Sally, a second-year doctoral students studying Environmental Engineering, talked about how the lab structure made it easy for her to form close relationships with her doctoral peers: "I have – these friends in my cohort and I can talk to them about both social things and about how classes are going . . . even if they're not actually in my sub-fields, they're still in my lab and I feel like the culture sort of naturally inspires a lot of interaction." The lab structure was particularly conducive for fostering this collegiality because the doctoral students' workspaces were organized next to one another in one common area within the lab. Whiney, an Environmental Engineering student used the word "family" and "community" to describe her lab environment of both doctoral students and faculty, in which faculty and students worked together as partners in conducting research, running experiments, and writing grant proposals to secure funding.

Many of the same Education and Engineering women who described their department and doctoral program cultures as collegial also perceived the doctoral environment as competitive. The attitude among the doctoral students is "every woman for herself." The structure of the doctoral programs in Education at NUES is such that the women did not receive a lot of funding so a lot of their time is spent on paid teaching and research opportunities that they take on to remain competitive for the academic job market, specifically if they want to pursue careers as faculty. Marie, a third-year NUES student studying Higher Education described the peer culture as one containing many "Type A" personalities; everyone works hard and has high expectations for their own and

others performance, but too many Type A personality people translates into a very intense learning environment. Marie reflects,

> So I guess it's a good thing to be in a place where everyone works really hard, demands a lot of themselves and others, and, you know, comes prepared, and that's always a good thing. On the other hand a lot of people take themselves really seriously and, you know, don't necessarily make time for, like, going to the bar and getting a drink or having a lunch or… So it's a lot of superficial relationships, a lot of sort of like, "Hey, how are you doing," but, you know… I don't know if the person really cares about the answer . . . and to a certain degree I don't blame them because we don't get a lot of funding.

Marie's reflection exemplifies how the NUES culture is one in which on the surface, students appear collegial and friendly, but behind the superficiality, the students tend to invest only in those relationships that will help advance their research or career development. The NIES women described this competition as something that is also inherent in Engineering and academic science culture. One of the NIES women from the focus group specifically talked about the nature of this competition: "I mean it's competitive and people, they think that they are very smart and they want to prove that they are smarter than you and it's – academia is competitive and science is competitive." For some of the Engineering women, this competition is part of a rite of passage that all new doctoral students have to experience as part of their induction into the department. One woman, Amy, said that the attitude within her research lab in Material Science was one in which every doctoral student was left to their own devices to figure out how to operate the lab equipment. The process of figuring out the equipment was almost like a

rite of passage that every new doctoral student had to go through. The mentality in her department was that more advanced doctoral peers had to figure out themselves when they were newbies, and so problem solving on their own was just something all new doctoral students had to figure out how to do.

This is just another example of gender schemas at work. The gender schema about doctoral education culture is the belief that doctoral education, as the crown jewel of the higher education system, is designed and perceived to be competitive because the hypothesis is that competitive people will be successful in doctoral education. Because being competitive is a traditionally masculine trait and is necessary for success, it perpetuates the idea that men will be successful in doctoral education because they tend to be more competitive. Men tend to be more competitive because society encourages and teaches boys at a young age that being competitive will enable them to be successful. However, when women are competitive, it takes away from their femininity because to be competitive is to be masculine. Again, these nuances are subtle but explain the women's perceptions of inconsistency.

Brenda, a seventh year student studying Human Development, expressed the inconsistency in NUES Education culture, which she perceived as both competitive and collegial. Brenda reflects, "For the most part, I mean I think that there is a certain amount of competitiveness that's just goes into what you are trying to accomplish, and the fact that I am sure our lab is not unique and that you are inherently competing against each other for the good reference, for the jobs, for the support. But at the same time, it's felt like an extremely supportive group of people overall." Brenda, like many other doctoral women, especially those studying a feminized field like Education, struggle with the

conflict that exists between acting collegial and supportive, a trait that is consistent with femininity, while also acting competitive which is a trait necessary to be successful in doctoral education but is simultaneously inconsistent with the gender schema associated with femininity.

In order to reconcile these two concepts, most of the Education and Engineering women capitalized upon the collegial nature of their environments, and leveraged the social capital that results from investing in and developing relationships with peers and faculty to advance their own research interests, dissertations, and career goals order to remain competitive in job market. This is part of the gender schema about doctoral education that requires a competitive trait in just to be admitted into a doctoral program to begin with. Thus, the idea is that the women can use the feminine trait of collegiality to their advantage by collaborating with others to advance their own interests and compete with their peers for the often limited career opportunities in academia as faculty, but also for careers outside of academia. Many of the NUES and NIES women mentioned that their competitive personality is precisely what enabled them to push forward and finish their doctoral degrees.

Both the Education and Engineering doctoral environments reflected the masculine gender schemas of proactivity, independence, and competition, and simultaneously the feminine gender schemas of flexibility and collegiality. However, there are unique aspects of doctoral education culture and structure in Education and Engineering that each group of women identified which shed light on the "essence" of doctoral education within each field. What follows is a discussion of the masculine "hidden curriculum" of doctoral education in Education, a predominately female

professional field, and how it compares to Engineering, a predominately male professional field.

The Essence of Doctoral Culture in Education: The Quest for Legitimacy

The Education women often referred to NUES as the "evil stepchild" at Northeast University because it is the least funded and least prestigious graduate school within the University compared to other graduate professional schools, despite being top ranked nationally. Thus, the Education women described NUES as a graduate school on a quest to maintain its legitimacy as a graduate school within an institution of historical prestige and excellence. To be perceived as more legitimate, the hidden curriculum is based on a masculine gender schema in terms of the type of knowledge that is valued at NUES. The women talked about how NUES values more quantitative methods of inquiry for answering educational research questions and justifying educational decision making as reflected in the Educational Research sub-specialty which only offers quantitative methods courses. The Education women were concerned about the dearth of qualitative research methods courses available in their program structure, and this was particular limiting for many of the NUES women. Michelle, a second-year NUES student studying Community and Diversity Education how the gradual elimination of qualitative research course offerings and increased focus on quantitative methods by NUES posed a problem for her because her research question required qualitative methodologies in order to be answered. Nicole, fifth year doctoral student studying Higher Education mentions how this shift in values about methods of inquiry is part of the hidden curriculum. Nicole reflects,

> I think that that's [the shift] something that's not supporting women . . . one of those shifts is quantitative methods. So, what are you doing . . . when you are moving what's important to that school to fields where there are more men. And what does that mean about the supports that you are going to provide, it seems like they are providing more support to men than women by eliminating the qualitative courses . . . I do feel like that notion of the hidden curriculum and like, what's not spoken and spoken . . . it's about making Northeast University more viable and making it more relevant in the field. But it just so happens that to make it relevant, you are pushing it toward more male-dominated ideas and more male-dominated subsets of education.

Nicole's reflection about this hidden curriculum of valuing more male-dominated ideas of research methodology such as objectivity, reliability, and generalizing quantitative methods of inquiry reflects the underlying gender schema of masculinity. The underlying gender schema is that Education, a historically feminized field, must adopt masculine forms of inquiry in order be perceived as legitimate, and equally rigorous methodologically as other fields and disciplines of study within Northeast University. By doing this, NUES is communicating to the doctoral students, many of whom are women, that the characteristics and inherent values associated with qualitative inquiry such as the ideas of capturing the richness of the human experience and the importance of context are not important in the Education field. Because many of these same characteristics are synonymous with women, the devaluation by NUES of qualitative research might be seen as the devaluation of women and feminine ways of inquiry about the human experience (Code, 1991; Glazer-Raymo, 1999). Instead, NUES values "scientific" methods of

inquiry, which is quantitative, generalizable and of a large-scale. Thus, according to this reasoning, any research that is qualitative which focuses on the individual context and is interpretive instead of generalizable is considered non-scientific and therefore inferior knowledge (Marshall & Rossman, 2006).

The hidden curriculum behind Education doctoral culture is one that values independence and autonomy, which are gender schemas reflective of masculinity. This hidden curriculum of independence and autonomy is inculcated into funding, research, and advising structures. Even though Education doctoral students receive tuition funding from the doctoral department, they must find a way to pay for the cost of living through short-term paid assistantships working as either research assistant or a teaching assistant for one faculty member. The Education culture is such that most doctoral students work three to five part-time jobs as research or teaching assistants in order to fund their doctoral education, and they often compete with one another to secure the fewer research opportunities and plentiful teaching opportunities available. As a result, it is common in Education for the women to spend more time teaching, activities that take time away from working on the dissertation, than on their own dissertation research and writing.

The structure of the dissertation research process in Education is one that creates an environment that is isolating, because typically doctoral students conduct the dissertation in solitude or at best one-on-one with their dissertation faculty advisor. This dyadic advising relationship only develops after the doctoral student has chosen his or her dissertation research topic, and is the primary locus for doctoral student socialization after coursework, when doctoral students have fewer opportunities to interact with their peers. Although peers are very important to Education doctoral students as a critical

source of support to fight the feelings of isolation that doctoral students feel, there are a fewer opportunities for this interaction which is primarily student initiated, rather than department initiated. Although it is common for women (and men) in Education to have children while in graduate school and is something that is moderately acceptable in Education doctoral culture, the Education doctoral program does not provide structural support within the institution to provide childcare services. This lack of structural support is reflective of the underlying masculine gender schemas of independence and autonomy. This communicates to doctoral students that the responsibility of childcare is left up to the individual doctoral student and is not the responsibility of the institution.

The Education doctoral culture, in its quest for legitimacy, has mimicked its values, beliefs, and structures after those of the traditional humanities disciplines such as theology and philosophy—and to a certain extent the sciences for disciplinary validation –because these disciplines that historically epitomized masculinity in the expectations of the doctoral training process. The doctoral training process in these masculine disciplines is one in which doctoral students serve as apprentices to one faculty expert and carry out research, often independently and in seclusion, on an esoteric topic to produce knowledge for knowledge sake rather than practical application. The underlying gender schemas at NUES is that the graduate school must exhibit more masculine traits in order to portray an image of legitimacy and prestige when faced with uncertainty about the place of the Education doctoral degree within doctoral education. The concern about the legitimacy of NUES as a graduate school of Education by Northeast University may explain the recent decision to merge the Education doctoral program with the College of Arts and Sciences,

a college that epitomizes masculinity due to the fact that it houses disciplines that have a long history of legitimacy.

The Essence of Doctoral Culture in Engineering: A Culture of Privilege

Doctoral culture in Engineering is based on a culture of privilege – the science, engineering, and mathematics (SEM) fields have been highly valued in American society because this knowledge is practical and innovative to enable the United States to remain competitive with other countries in today's global economy. The knowledge that is valued in Engineering culture is that which is practical and innovative, which are characteristics consistent with masculine gender schemas because they emphasize the masculine traits of agency and action. The methods of inquiry in Engineering are almost entirely quantitative, which means they are based on the ideas of rationality, objectivity, and generalizability. Thus, applied knowledge is based on testing hypothesis using experimental or computational methods. Thus, the value and rigor of this knowledge is never questioned because it is grounded in the Engineering culture, a culture of privilege and therefore by definition it is legitimate. Applied knowledge in Engineering is privileged most notably in terms of how it is funded. Research that had applied implications is particularly important in order to receive funding from the federal government and/or federally-sponsored agencies (COSEPUP, 1995/2007; National Academy of the Sciences, 1985). The women in the focus group expressed the importance of studying applied problems

> If you want to get funding, you always come back to justify your project with the practicality of it . . . you can do a project that's useful if someone wants to fund it

> . . . so I think that's why NIES has so much funding. You have so many great practical projects.

Because applied scientific knowledge is privileged in that it is supported by federal grant funding, Engineering faculty who secure grants for contributing to applied knowledge are able to use the funding to adequately financially support doctoral students to work on these projects. These doctoral students are "privileged" in the fact that their tuition is paid for and they receive a large enough annual stipend so that they can afford to only work one part-time job as a research assistant while in graduate school, instead of three to five part-time jobs In addition, not only do these external grants provide adequate funding for Engineering doctoral students, but the research project serves as the basis for the doctoral students' dissertation research (Goldman & Massy, 2001). Thus, the funding and dissertation research structure is more intentional in ensuring that doctoral students are successful.

The nature and structure of the dissertation research and advising in Engineering also reflects the underlying culture of privilege. Incoming doctoral students are assigned to a lab, almost always funded by a federal research grant, and that research project and lab is the locus for funding the cost of their doctoral education and starting dissertation research. These women are able to spend the majority of their time working on their dissertation research project in a lab that is generously funded by a federal or corporate research grant. Funding is seldom a concern in Engineering, nor is degree progress because the women are working on their dissertation research beginning their first year in the doctoral program. The Engineering culture expects that doctoral students will devote themselves full time to doctoral study, which is why students often decide to enroll in

doctoral programs immediately or within a couple of years after completing their undergraduate degrees in Engineering (Goldman & Massy, 2001; Golde & Walker, 2006; Walker, et al., 2008). As such, because doctoral students are expected to dedicate themselves full-time to doctoral study, they are discouraged from having children while in graduate school. None of the Engineering women had children which is characteristic of Engineering culture. These women receive generous financial funding which enables them to focus 100% of their efforts on doctoral study, and so they "dare not" have children because it means they would be compromising full-time doctoral study, which is the norm in Engineering doctoral culture (Golde & Walker, 2006; Gonzales, Allum & Sowell, 2013;Walker et al., 2008).

Engineering culture is one in which the dissertation research process is collaborative. Although each doctoral student conducts his or her own dissertation research individually, it is common for doctoral students to conduct these experiments alongside advanced doctoral peers and post-doctoral students, as well as the faculty member who is the primary investigator of the research project in a lab. This "lab" structure provides more opportunities for peer interaction and a supportive environment for facilitating degree progress. In Engineering, the construction and production of new knowledge is a collaborative and collegial process in which peers and faculty are key contributors. This culture of collaboration is reflective of more feminine gender schemas, because it reflects characteristics more commonly associated with femininity and women. This culture of collaboration and collegiality characteristic of the research process in Engineering is surprising considering that almost all other aspects of Engineering culture such as proactivity, independence, competition, and objectivity reflect more masculine

gender schemas. The irony is that Engineering culture, despite having a highly masculine gender schema, also incorporates characteristics of femininity, as evidenced in the collaborative and collegial research environment within the labs. Thus, the Engineering culture, as it exists at Northeast Institute Engineering School, is more androgynous than what most of the literature on the "chilly climate" of science and Engineering fields may suggest (Eisenhart, 1994; Ferreira, 2002/2003/2010; Glazer-Raymo, 1999; Hall & Sandler, 1982; Hartman & Hartman, 2008; Morris & Daniel, 2008).

Summary

The culture and structure of Education and Engineering doctoral education reflect both masculine and feminine gender schemas, although both fields exhibited more masculine gender schemas than feminine ones. Doctoral education in both fields was described as proactive, independent, and competitive, which are more consistent with masculine traits rather than feminine ones. The prevailing gender schema associated with doctoral education and by extension the academic profession is one that is traditionally masculine. This is because doctoral education has historically been and is currently structured and delivered in ways according to masculine values, norms, and beliefs. However, even though both Engineering and Education espoused values of flexibility and collegiality, which are more consistent with feminine gender schemas, these feminine gender schemas were more apparent in the culture of Engineering, a traditionally masculine field, than in the culture of Education, a traditionally feminine field. Next, I discuss how the gendered environment of doctoral education as it exists at NUES and NIES inevitably influences women's doctoral experiences and in turn their degree progress.

RQ#2: How do the experiences of women enrolled in doctoral programs in Education and Engineering influence their doctoral degree progress?

The women studying Education, a prototypically "female" field, had relatively negative doctoral experiences as they struggled to progress and succeed in an environment in which their primary activity was to work to serve the needs of others, whereas the women studying Engineering, a prototypically "male" field worked in the lab conducting their own dissertation research to benefit themselves. The crucial components of the doctoral experience, the funding structure, student-faculty advisor relationship, and the peer environment discussed in the last chapter, reinforced these gender schemas and in turn influence women's degree progress. The gender schema for the women studying Education as a historically feminized field is that the doctoral experience is structured around the hypothesis that doctoral students work to serve others, other faculty, administrators, and clients. In contrast, the gender schema for women studying Engineering reflect a hypothesis more commonly associated with men, which is the Engineering doctoral experience is about working to serve oneself, that is working in the lab to collect data for one's own research projects and dissertation. The reason for this difference lies in the nature of the funding structure.

Education Gender Schema: Working to Serve Others

The funding structure for doctoral students in Education as a predominately "female" field promotes an environment in which doctoral students work for others in order to fund their own doctoral education; thus, they are ultimately serving/working for others as a means to fund their doctoral education, and not necessarily because that . Though it could be argued that doctoral students 'work for' faculty and their funded

research sponsor in Engineering, that work is also professionally self-serving, whereas in Education the work that is performed is typically not self-serving (Nettles & Millett, 2006). It was typical for these 10 Education women to work three to five part-time jobs throughout the academic year just to afford to live, despite having their tuition, fees, and health insurance covered by NUES. This is due to the funding reality in Education – Education is not a privileged field like the Engineering field is in terms of American society's interest in allocating federal dollars to fund educational research. There are very few opportunities for Education to secure external grant funding, and so instead, Education doctoral students are funded by their doctoral department. (Perry & Imig, 2008; Walker et al., 2008). Thus, the majority of doctoral students piece together multiple paid assistantships based on short-term projects provided directly by the department. Three of the 10 Education women even took out loans to supplement the cost due to the inadequate level of financial support from the department. Because their funding is contingent upon the department and its resources, and funding was not guaranteed past the first year, almost all of the women were concerned about funding. The inadequate funding and working multiple paid assistantships, common of the Education doctoral experience, affected the women's doctoral degree progress because it meant that the women were spending time performing work for others to fund their existence rather than on performing research or writing their dissertation.

The type of work that these women were expected to perform involved conducting research, teaching, and consulting on projects for other people, including researchers, teachers, and policymakers. The expectation for the Education doctoral women at NUES to spend most of their time doing work for other people is gendered in

that it mimics the gender roles that women taken on in the home as wives, mothers, and caretakers – they work to serve others and satisfy others' needs before their own. Rachel is an excellent example of how working to serve others' needs takes times away from working to serve herself. Rachel said it took her almost four years to complete her qualifying paper, a major milestone in one's degree progress, partly because she was spending all of her time doing work for others, and partly because she was struggling to define her research topic and question(s). However, Rachel ensured that she would benefit from this work, as she co-authored five papers in the last three years she has worked with her advisor as an RA.

On the other hand, Alicia, a third-year NUES student is the anomaly within the group of NUES women as she doesn't believe or feel there is a need to work in the service of others. Alicia worked an entire lifetime teaching and serving others, and for the first time she is pursuing a doctoral degree for herself. She doesn't want to work on anybody else's research or interests but her own. Because Alicia spends almost all of her time working on her own research and advancing her own career, she has progressed very quickly in her doctoral program. As a third-year doctoral student, she is already working on her dissertation proposal, after recently completing her qualifying paper. This idea of working for oneself was a part of the culture of Engineering and facilitated degree progress because of the alignment between funding and the dissertation.

Engineering Gender Schema: Working to Serve Self

The Engineering doctoral experience centers around the research lab, which is both a funding structure and also a mechanism for degree completion. Unlike Education, the Engineering funding reality is that Engineering is grounded in and sustained by a

culture of external grants received from the federal government and certain businesses, and as such, doctoral students are funded by those grants which provide adequate funding for multiple doctoral students year round. Because American society privileges Engineering and applied science knowledge and believes these areas of knowledge are critical to economic competitiveness, there are many opportunities to secure external grant funding in Engineering (COSEPUP, 1995/2007; Goldman & Massy, 2001; Nettles & Millett, 2006). With plenty of grant funding, Engineering doctoral students at NIES are paid to spend their time conducting research, and running experiments or simulations in the lab, which ultimately serve as the basis for their doctoral dissertations. They are funded to work to advance the interests of the primary investigator in the lab, as well as themselves simultaneously.

The expectation that Engineering doctoral students will spend most of their time doing work for themselves mimics a masculine gender schema because it reflects common characteristics associated with men which include independent and action-oriented. This culture of working to serve oneself in Engineering also reflects schemas about the division of labor between the sexes, which is men are not responsible for serving others inside the home since serving others is reserved for women as it is a feminine trait (Valian, 1999). It is in these ways that the culture of Engineering as a prototypically male field and the underlying belief of the need to focus on one's own intellectual ideas and work enables the NIES women to devote all of their time to their doctoral dissertations and hence may explain their timely degree progress in comparison to the Education women at NUES.

The gender schemas of working to serve others versus working to serve oneself in Education and Engineering, respectively are reflective of the reality of the funding structure in the two fields. Even though the funding component of the doctoral experience ultimately shapes doctoral degree progress, it is a complex issue. Field differences between Education and Engineering will inevitably exist and is not something that can be changed in the short-term, due to privileging of grant funding that exists in Engineering and the sciences and the dearth of research grants dedicated to Education research. Next, I describe how gender affected the doctoral experiences and in turn the degree progress of the doctoral women in each field. The Education women perceived their gender as a negatively impacting their doctoral experience, whereas the Engineering women perceived being a woman as having no effect on their experience and yet a positive effect on their degree progress. Gender did equally affect both groups of women's doctoral experiences and degree progress perhaps in ways that the women were not aware.

Education: Being A Woman Negatively Affects the Experience and Degree Progress

When asked about how gender mattered to their doctoral experience and degree progress, the Education women and Engineering women responded differently. The Education women said indeed that their gender negatively impacted their doctoral experiences and degree progress in two ways; 1) The Education women perceived that male doctoral students were given preferential treatment in the classroom and for research assistantships; 2) The Education women perceived they were at a disadvantage because they recognized that they are preparing to enter the male-dominated environment of educational leadership and policymaking.

Even though two-thirds of the doctoral students are women, the Education women perceived men were given preferential treatment by female faculty at NUES. The NUES women talked about the nature of interactions between faculty and doctoral students in the classroom throughout their doctoral experience. The majority of the women interviewed perceived that the men receive preferential treatment in the classroom, and that female NUES faculty tended to be "harder" on female doctoral students. Nicole, a fifth-year doctoral student studying higher education, reflects:

> I feel like women faculty members can sometimes be harder on women students than they would be on men. And I don't know if it's causal or correlation or like, I don't know if it's because men are more showing of themselves, they don't needed to be like pushed as much as women, or women are questioning themselves because they are being pushed more by female faculty . . . but I just have seen women faculty be harder on women especially in the quantitative fields than they are with men.

Nicole's reflection is especially important considering that women represent two-thirds of the doctoral students and faculty at NUES. It could be that because there are fewer men in the classroom and more women, there are more opportunities for doctoral students like Nicole to observe and recall instances where female faculty treat women students more harshly than men. However, other NUES women have observed a similar bias, and they often think they are the only ones who notice this. Despite representing one-third of the doctoral students enrolled at NUES, male doctoral students were perceived as having an equal, if not dominating, presence in their courses. These women perceived that the male doctoral students spoke more often and ensured that their voices were heard in the classroom discussions. Marie, a second-year student going into her

third year in the doctoral program said she asked herself, "why does it feel like they [male doctoral students] are the authority on things, or . . . why everyone like shut up does and listen when they interrupt someone? That's sort of my take on . . . my personal experience of being a woman at NUES is I was like constantly being aware of that." The women mentioned that the male doctoral students weren't afraid and often interrupted other (female) doctoral students in classroom discussion, and attempted to "schmooze" with the female faculty members in order to create a favorable impression and ensure they are noticed. The NUES women talked about how the few men in their classes were able to joke with the female faculty in ways that the women did not. The women perceived that the men behaved this way intentionally to ensure they were rewarded by the female professors in the form of a high grade or a research or teaching opportunity in the future. In the NUES focus group, one of the women mentioned,

> There's this very weird dynamic here where men are 25% of the student body but seem to dominate classroom discussion or you know get half the dean summer fellowships . . . I feel like there is a preference for men when they're 25% of the student body so it feels a little….disproportionate.

The NUES women reflected that women tended to demonstrate their intellectual capabilities and promise as doctoral scholars in the classroom by doing the work; they hoped that their writing and knowledge would speak for itself. These behaviors are very consistent with the literature on the "chilly climate" for women in academia, where women act in accordance with their gender schemas (Hall & Sandler, 1982; Morris, & Daniel, 2008). Men speak up in class and take action because it is consistent with the gender schema of masculinity, whereas the NUES women are somewhat passive in class,

despite being the majority, and by doing so they confirm to the gender schema of femininity. If the NUES women acted as forcefully or were as outspoken, their behavior would violate the gender schema for women, and therefore could be interpreted as acting like a man.

One reason why the women perceived the men were treated favorably might be because they are the underrepresented minority. As was the case in Engineering, the women believed that their status as the minority in Engineering afforded them opportunities that they might not have otherwise had as the majority. The same could be true for the male doctoral students in Education. Because NUES is cognizant that men represent only one-third of doctoral students at NUES, the faculty might pay particular attention to ensuring they incorporate male perspectives into classroom discussions and also ensure that men's achievements are equally recognized and that they have opportunities for achievement, even if it is at the expense of the women doctoral students as the majority. Another reason why the men were treated so favorably by the faculty in the classroom is that despite their minority status at NUES, men still possess a level of privilege because their perspectives are still perceived as the authority as illustrated in Marie's comment above about how everyone else in the classroom, women included, just "shuts up and listens Men are often perceived as the authority on many ideas because of the patriarchal nature of the society in which we live and work – men's perspectives are consistently more highly valued than women's (Tong, 2009). Thus, these affirmative action efforts to increase the representation of men in Education, as well as women in Engineering, can have negative consequences for women as participants in either highly gendered field.

Though they constitute the majority at NUES, the Education women are preparing to enter the male-dominated environment of educational leadership and policymaking. Education is considered a female-dominated field because the women are concentrated at the lower levels as teachers, educators, and faculty. Doctoral programs in Education prepare students with the knowledge, skills, and core competencies to enter a male-dominated environment as educational leaders at all levels within the Educational system as faculty, administrators, and policymakers. Rachel, a NUES doctoral student talked about the gendered professional environment within educational leadership and administration as one of "daddy and the girls." That is, the decision makers of Education at the highest levels within elementary, secondary, and post-secondary education systems are often men, and it is men who are in charge of making decisions about how teachers, predominately women, are to deliver an education. This is a problem for female doctoral students who are preparing themselves for entry into a profession where they will be working with mainly male leaders and will be the minority as educational leaders, administrators, and policymakers. One of the women in the NUES focus group illustrates this point further and says, "yes it's a woman dominated field of teaching, not administration or superintendency, and then we have academia, our faculty is primarily males. . . . We don't live in a female dominated industry . . . so I think when a white male shows up, people are already salivating here, ready to salute."

When men enter the female-dominated field of Education, they are automatically highly regarded. Women, who often make up the majority of the workforce as teachers and junior faculty in academia, are expected to look up to educational leaders, in particular when those leaders are men. Because the doctoral degree is preparing these

women for leadership, administrator, and policymaker roles which the women perceive to be a male-dominated sub-field within Education, the Education women are preparing themselves join the ranks of men. They agreed that being a woman was going to matter to their future professional success as the educational leaders and decision makers. The Education women automatically assumed that their minority status as women in the male-dominated environment would mean they would be at a disadvantage because they feared that men (and other women) wouldn't respond well to them as leaders. Being perceived as likeable is a common concern for women, considering that success and likeability are negatively correlated for women, but positively correlated for men (Heilman & Okimoto, 2007).

In sum, the consensus among the Education women was that their gender negatively influenced their doctoral experiences and degree progress, and future professional success as educational leaders, administrators, and policymakers They perceived that even though NUES is a female-dominated graduate school in terms of the female faculty and student representation, at the highest levels, the doctoral environment was one in which they perceived men were favored. Some of the NUES women also mentioned they perceived that doctoral men and didn't have to work as hard as women to be successful and listened to, both at NUES and in the Education field. In contrast, being a woman in Engineering at NIES was positive for doctoral degree progress because it afforded them additional opportunities for career guidance and support.

Engineering: Being a Woman Did Not Affect Experience but was a Positive for Degree Progress

For the Engineering women, their gender did not matter for their doctoral experience because they perceived the Engineering culture and program structure as meritocratic; that is, doctoral students are treated based on individual merit and effort rather than their gender or the gendered environment. Sally, an NIES student mentioned "I think generally NIES really values accomplishments and intelligence, so like they're – like very excited if someone is good and they will respect them whether they are female [or not]." Similarly, Katherine talked about the meritocratic culture at NIES as an institution that only cares about the mind, and that one's accomplishments and abilities will shine through in the lab. The NIES women conferred that they felt respected and believed they were treated equally well as men at NIES, both within their lab and within the classroom, and that they rarely thought about their gender and how it affected their doctoral experience.

Engineering women at NIES perceived that their gender had a positive effect on degree progress. Being a woman might not have mattered to their doctoral experience, but the NIES women perceived being a woman benefited their degree progress because it meant they received special opportunities for professional guidance and career support. Northeast Institute and NIES offered additional women-centered professional development opportunities and workshops geared towards advancing the success of women in academia as well as in the Engineering industry. One woman, Whitney, who was considering an academic career, mentioned the critical importance of a woman-centered preparing future faculty type workshop. She said, "I would say that

this particular workshop was a very positive experience in my graduate career . . . the workshop itself made me much more confident that I could pursue a faculty position and be successful." This workshop was just one example of how NIES institutionalizes promoting the advancement of women pursuing STEM faculty careers. Engineering women were able to benefit at NIES by taking advantage of workshops that are targeted toward women in order to ensure they are successful. The availability of these women-only professional development opportunities means that NIES recognizes the gender inequality that exists among faculty in STEM.

Also, a few of the women who participated in the focus group were quite active in women-centered student and professional organizations that Northeast Institute organizes which the NIES women believed helped build camaraderie and networks which were helpful for degree progress. This institute-wide support for women was especially helpful for those who did not receive much support in their individual doctoral programs. Sara, a Civil Engineering doctoral student talked about the Northeast Institute Graduate Education Office as particularly helpful for her degree progress because of the various opportunities they have sponsored such as conferences and panel discussions with female professors. She mentions, "So those things which I guess the institute put in place to help have been extremely helpful in terms of not just like professional development, but also trying to create a sense of community, because in my department there isn't much, because we're such a small group."

It is interesting that many of the NIES women did not believe that gender mattered to their doctoral experience but at the same time they recognized that their gender mattered in terms of the additional professional development opportunities they

could take advantage of at NIES. It seems that the women tended to ignore gender when it did not benefit them or potentially hindered their performance and acknowledged their gender when they perceived it was a benefit as the "minority group" in Engineering. Only one of the 11 NIES women expressed her uneasiness with the idea of NIES provided additional programming and support only to women because she recognized that NIES acknowledged and recognized that women were at a disadvantaged and needed to be helped in order to be successful Engineers or academics like men already were. These women-only professional development and career-guiding programs actually perpetuate the existing gender inequalities surrounding Engineering and STEM fields by reinforcing the gender schema that served as the impetus for the creation of these programs in the first place – that women in Engineering are already inferior to men and therefore need additional help so that they can perform as well as men.

A likely reason why some of these women did not perceive gender to have mattered to their doctoral experiences is because the Engineering doctoral women are pioneers for women in the Engineering profession. All of these women have been successful throughout their educational careers in SEM fields which has afforded them entry into a doctoral program in Engineering in the first place. Most of the research about women studying science and engineering suggests that gender is a barrier to their success because of historical and socially constructed gender schemas about women's inability to handle the academic rigor of science, engineering, and mathematics (Code, 1991; Glazer-Raymo, 1999/2008; Martinez Aleman & Renn, 2002; Valian, 1999). As stated in Chapter Two, gender presents a multitude of individual, institutional and societal barriers that negatively affect women's experiences such as feelings of self-doubt, poorer interactions

with their mostly male faculty advisors, a lack of collegiality, an isolating and competitive doctoral environment, and society's assumptions about women's limited capabilities (Ferreira, 2002/2003/2010; Litzler, Edwards-Lange, & Brainard, 2005; Martinez Aleman & Renn, 2002; Moyer, Salovey, & Casey-Cannon, 1999). Nettles & Millet, 2006; Thelin, 2004). The Engineering women at NIES may have faced these barriers at one point in their scholastic careers but might not perceive these as barriers since these women have been successful in science culture, despite their minority status as women in a male-dominated field.. As girls and women, these Engineering students have been rewarded for successes that fit science's gender schemas as a traditionally masculine field, and this may be why they. perceive that gender does not matter to their doctoral experience and success.

Even though women can and do experience the doctoral environment differently than men, the Engineering women at NIES were not conscious of the ways in which the culture of Engineering, constructed around masculine ways of knowing, thinking and behaving as the norm, might affect their experiences and degree progress. Thus, if they are not conscious of the ways in which the doctoral environment may be sexist, the Engineering women could not see nor verbalize any instances of overt sexism. The NIES women may have been impacted by more subtle gendered micro-aggressions in the ways they have been treated by the faculty, other students, or the administration. Also, these women may not have questioned the existing gendered expectations in Engineering, many of which are based on masculine gender schemas (Bem, 1981; Valian, 1999). One of these micro-aggressions is the "dare not have children" attitude of the department which discourages women from displaying their femininity and confirms to masculine

ways of viewing child rearing responsibility. One wonders if male in Engineering feel the same pressure to delay having children while engaged in their doctoral work?

In sum, the Engineering women did perceive that gender mattered to their doctoral experience and degree progress, and this was because the women were not fully conscious of the ways in which their gender affected their experience. One reason why the Engineering women had such positive experiences in their doctoral programs was precisely because of their minority status as female students studying Engineering. Many of the of Engineering women mentioned that their gender afforded them additional opportunities to participate in women-centered professional development workshops and develop critical networks with women engineers and faculty to enhance their probability of success in their future careers. These professional advantages might have contributed to their reporting of positive doctoral experiences. NIES as a graduate school might be overly conscious of the ways in which it promotes and advances women in Engineering which might mean the department concerns itself with ensuring that women, as an important minority group, have positive doctoral experiences and progress to earn their doctoral degrees. Commonalities and differences in degree progress is the topic addressed by the third and final research question that guided this dissertation.

RQ#3: How does the support for and barriers to women's doctoral degree progress in Education compare to the support and barriers to women's degree progress in Engineering?

Peers Were Most Important Supports

One of the major themes presented in Chapter Six of this dissertation was that doctoral peers were a critical source of support for both the Education and Engineering

women for degree progress. Advanced peers were especially helpful because they could impart knowledge about what was expected of doctoral students to the newbie doctoral students with each cohort. Peers, and especially advanced peers, could take on some of the same roles as a faculty advisor in their interactions with the newbie doctoral students, especially when faculty advisors were unavailable or could not dedicate the time and energy to provide students with the academic and technical guidance, emotional support, and career advice their advisees desired. Peers could commiserate with the women in both their successes and challenges while pursuing their doctoral degrees in Education and Engineering, respectively.

The major difference between the Education and Engineering women is that the culture of peer support in Education was initiated by the students themselves, whereas the culture for peer support in Engineering was organized by the department and doctoral program faculty and administration. Because the peer culture was not already institutionalized at NUES and the research assistantship structure was isolating, it was more difficult for the NUES Education women to form and maintain critical peer networks. In Engineering, because the NIES departmental faculty and the research assistantship structure encouraged frequent peer action, it was easier for the NIES women to build and maintain close relationships with their peers beginning first semester, which was one of the primary facilitating factors for their degree progress.

Education supports: doctoral program office and progress memos. The women in the Education focus group mentioned the critical role of the Education doctoral program office as a unit that specifically helped facilitate their degree progress. The doctoral program office had one primary academic administrator, many advisors, and

other support staff to specifically assist doctoral students with navigating through their doctoral programs. The doctoral program office handled all of the administrative paperwork and communicates the necessary steps to complete each of the major milestones: coursework, the qualifying paper proposal, the qualifying paper, the dissertation proposal, the oral defense of the dissertation proposal, the doctoral proposal review committee process, dissertation writing and submission process and deadlines. The NUES women said the administrators, not the faculty, who helped them stay on track to submit the necessary paperwork and meet required deadlines.

One of the key communications to keep doctoral students on track with their degree progress is yearly "progress memos." The doctoral program office requires that each student complete a progress memo at the end of each academic year, right around finals time. The academic progress memos are an opportunity for the doctoral student to provide a summary of his or her activities throughout the past academic year and propose goals and activities for the next academic year. With each progress memo, doctoral students are asked to discuss how they accomplished each of their previously planned activities, or if they did not complete some planned activities, they provide justification as to why their activities deviated from the plan. In response to the progress memos, doctoral students receive "warning letters" from the doctoral program faculty steering committee if they have not reached certain milestones. Brenda, a doctoral student studying Human Development, likes the idea of the progress memos, but not the letters. She says, "The doctoral programs office has been really helpful in helping me understand the message that's underneath [the letters]. . . . you know, they are trying to figure out, they are trying to move us along, and they are trying to figure out what can they

reasonably expect with people to move them along, but the tone of the letters is really unpleasant." Because Brenda didn't complete everything she said she was going to do in the prior year's progress memo, mainly because she took time off to care for her newborn baby, she felt as though the letter was chastising her for not making adequate progress.

Engineering supports: research lab structure. For the Engineering women, the research lab is at the center of the Engineering doctoral experience and is structured to facilitate students' degree progress. Consequently, the NIES women began working on their dissertation research in the lab as first-year students. For the next five years, NIES students spend most of their time with the same group of doctoral students working under a PI , who also serves as their faculty advisor, in an environment where the research process is collaborative. The physical structure of the research lab is such that as doctoral students' workspaces are situated next to one another so that they interact with another and their faculty advisor on a daily basis. NIES students use these opportunities for frequent interaction to seek advice and support from both their advanced peers and their PI until they complete their degrees. The research lab is an intentional structure designed to facilitate students' doctoral degree progress because it forces doctoral students to begin working on their dissertation project as soon as they begin their doctoral programs; students don't have to wait until after coursework is finished or they pass a qualifying exam to begin their dissertation research and writing.

Common Challenges to Degree Progress: Doctoral Culture and Structure

The most common challenge to degree progress for doctoral women in both Education and Engineering was the independent culture and ambiguous program structure. Both groups of women agreed that doctoral education was not designed to be a

supportive environment because it reflects masculine gender schemas. T Education and Engineering women agreed that the culture and structure of doctoral education in their respective fields is not supportive for women because doctoral students are expected to struggle and figure out how to navigate their doctoral program and complete the milestones on their own. Both the Education and Engineering doctoral education cultures emphasized proactivity, independence, and competition, and yet collegiality was superficially encouraged both by the faculty and peers. The women mentioned that it was not surprising to them that the doctoral education culture and structure was not supportive of doctoral students, since they did not expect doctoral education to be a supportive environment, although it would be nice. In addition, the NUES and NIES women made it clear that they did not necessarily think doctoral education was unsupportive. Support structures do exist, but doctoral students are expected to take responsibility and actively seek out the institutional resources they need in order to succeed.

Nevertheless, some other Education and Engineering women I interviewed did not like the flexible structure of the doctoral program, specifically the dissertation development phase of the doctoral program. About half of the Education and Engineering women said the “ambiguous” milestones and degree requirements caused feelings of uncertainty about how to navigate through their doctoral program. The women who preferred more structure talked about how they were struggling to understand what they should be taking for courses and the types of research, teaching, or other experiences they should be involved with in order to prepare them for a particular career path. Brenda, a seventh year doctoral student studying Human Development, expressed that she wished

her doctoral program was more structured for figuring out the "how" question of how to develop a dissertation topic and investigate it. She shares,

> [The NUES doctoral program] had a fair amount of flexibility in terms of thinking about what you want to do and how you want to do it. . . But it certainly made the early years in the program challenging, because I just couldn't figure out what I was doing or how I was going to do it and there was nobody helping me see a path . . . Does it [the flexibility] support my doctoral progress? It probably didn't support my doctoral progress in that my doctoral progress has been fairly slow and certainly would have been faster if somebody was just moving me along.

Brenda talked about how she really needed the guidance, especially early on in her program, because she didn't have a clue about how to do research and what it meant. This feeling is common for women doctoral students in Education, a field where the research process might be an entirely new experience depending upon whether they engaged in research as an undergraduate student. This is because research methods are not typically taught as part of the curriculum for undergraduate students who major in Education and/or the social sciences (Perry, 2011; Perry & Imig, 2008). For Brenda, the ambiguity was a specific challenge to her degree progress, which has been slower than her peers, as Brenda was beginning her seventh year in the doctoral program at the time of these interviews and just completed her dissertation proposal.

In contrast, the research process is not at all a new experience for Engineering doctoral students who were involved in research as undergraduate students majoring in Engineering or the physical or natural sciences (National Academy of Sciences, 1985; Goldman & Massy, 2001). Nevertheless, the Engineering women also preferred more

structured guidance, not in terms of research, but instead how to satisfy the doctoral program's curriculum requirements. The NIES women perceived that the departments do a good job of articulating the program requirements and "milestones" to complete in the departmental and doctoral program handbooks, but yet they perceived the actual processes of "how" to fulfill these requirements and milestones is as ambiguous –about half of the NIES women I interviewed did not like this ambiguity. Heather, a third-year Aero-Astro doctoral student, talks about this ambiguity as a real challenge to her degree progress. When asked about her challenges, Heather answered,

> I think keeping yourself on track in terms of the time the degree is going to take you is definitely a huge challenge because . . . the department has deadlines . . . but they don't enforce it that well. And even though they say well, you have to have your proposal defense done a year and a half after your qualifying exams, there's no steps towards getting the proposal defense done. You just have to sort of do it yourself and like there's these big wishy-washy milestones that you don't quite know how you're going to achieve them . . . they're not all that clear about how to get there.

Heather's comment above is typical of what half of the 11 NIES women expressed during their individual interviews – even though they believed their doctoral programs did a good job in outlining each milestone, they wanted to receive more direction as to the specific steps for completing each milestone, such as the qualifying exam and the dissertation proposal. Because these specific "how" questions were not answered in the handbooks and manuals, the NIES women sought out more advanced peers for answers about how to complete each milestone.

Regardless of the gender of the field, both the Education and Engineering women expressed a mild level of discomfort with the ambiguous nature of their doctoral program structure. When I asked all of the women whether they perceived that men expressed or shared similar concerns of discomfort about the ambiguity of the program structure, some of the 21 women were unsure, but more than half of them said that the men did not appear to be uncertain and instead preferred the flexible structure.

Because I did not interview men, I cannot ascertain whether the male doctoral students at NUES and NIES whether actually were more comfortable with the flexibility and ambiguity, but it is interesting that both groups of women studying two very different gendered fields expressed discomfort with uncertainty and that some perceived their male peers as unconcerned. This finding can perhaps be explained by gender schemas behind how women and men are expected to behave in the professions, an artifact of social gender schemas. Whereas men are socialized to be leaders and self-determining, women are socialized to follow pre-established rules and within a structured environment where they are told what to do in order to be successful (Bem, 1981; Valian, 1999). This might explain why the majority of the doctoral women, irrespective of field of study, were uncomfortable with the lack of structure given for how to successfully navigate their doctoral education. The male doctoral students may have been more comfortable with the ill-defined structure because it is more consistent with the gender schema requiring independent and autonomous action which are traditionally masculine traits, whereas for women, acting autonomously in the loosely structured doctoral program environment may be more difficult because these behaviors are less consistent with the feminine gender schema of passivity, agreeability, and following the rules. Even though both men

and women can and do exhibit both masculine and feminine gender schema, these gender schemas are learned and inculcated into expectations from a very early age, and so it might be more difficult for women to succeed in professional environments where traditionally masculine traits are valued and reinforced over feminine ones (Bem, 1981; Valian, 1999).

The doctoral women did not expect the doctoral environment to be supportive of women's degree progress because doctoral education and its value systems and structures still reflect masculine schemas – the value placed on proactivity, independence and autonomy, and competition is inherent in doctoral education, since it is reserved for the most academically elite individuals who spent the majority of their doctoral programs investigating a specific topic in solitude. Also, it is not surprising that both women studying Education, a prototypically female field, and Engineering, a prototypically male field, expressed dissatisfaction with the ambiguous structure of their doctoral programs and may be reflective of the gendered expectations that women internalize from childhood, that is to wait for direction and to follow the rules. The women may have been successful in their previous educational careers by following other people's direction, and now as doctoral students, they are uncomfortable with the ambiguity that exists when given the freedom to structure their own doctoral education. Although three or four of the 21 women, both at NUES and NIES, liked the ambiguous structure because it meant they could make their own rules and work on their research at their own pace, the majority of the women did not and expressed that their male counterparts appeared to embrace the ambiguity and were more proactive about shaping their own doctoral experiences according to their individual career goals.

Different Challenges to Degree Progress

Whereas funding and negotiating the demands of motherhood with their doctoral programs was the biggest challenge for Education women, funding and children were not at all a concern for the Engineering women who were adequately funded and childless. Instead, sexism was a prevalent challenge for the Engineering women, which many of them did not acknowledge. Every single Education woman mentioned that securing adequate funding was a struggle during her doctoral program, and this is due to the funding realities discussed earlier in this chapter under research question #2. The reality is that Education doctoral programs don't have the backing of federal or corporate research grants like Engineering does, and so as a result, the majority of the funding for Education doctoral students comes from the doctoral department, which covered only tuition, fees, and health insurance. Additional stipends to provide avenues for the women to financially support themselves and also accumulate necessary research and teaching experiences to prepare them for an academic career were available in the form of short-term assistantships, often lasting only a semester or year at best. Thus, it was the norm for the Education doctoral students to work between three and five part-time assistantships to earn enough of an annual salary to afford the cost of living while studying full-time. Although there were plenty of opportunities for paid work, there was no guarantee that these research or teaching assistantships were aligned with their dissertation research topics and interests, and often these activities inhibited their doctoral degree progress because it meant the women had less time to spend working on their dissertation.

In contrast, only two of the 11 NIES women had concerns about finding funding for their doctoral education – Heather was an international student on a student visa which limited her eligibility for federally funded Aero-Astro grants which required all doctoral students to be citizens. Another woman, Sara, had to struggle to find funding each and every semester and worked mainly as a teaching assistant to afford to live. The majority of NIES women were guaranteed to have their tuition, fees, and health insurance funded, in addition to an annual stipend of $30,000 - $32,000, for performing just one part-time job as a research assistant. This stipend provided through either the department or the research grant was typical of first-year doctoral students who received a larger stipend after they passed their qualifying exams and became doctoral candidates. Almost all the Engineering women agreed that it was enough for a single person to live on for an entire year, summers included.

Another difference between the Education and Engineering women was that motherhood emerged as a challenge for four of the 10 Education women who were simultaneously mothers and full-time students, whereas motherhood was not an issue for the Engineering women because none of them had children. Having to negotiate the time, energy, and resources for raising children was a real challenge for the four Education women who had children because NUES did not provide any on-site supervised childcare services. There was a room in the library where doctoral students could bring their children to play but the there was no supervision. All four of the women mentioned having children as a barrier to degree progress in that the women had to negotiate the time they spent on campus and at home. Three of the four NUES women gave birth during their doctoral programs, and all three mentioned that the birth pushed back their

degree completion by one year. Rachel was the only mother who completed her doctorate according to her original timetable of six years only because she had the help of a full-time nanny. The nanny took care of her twins while she analyzed her data and wrote her dissertation in her sixth year. Rachel acknowledged that even with her husband as a partner, there was no way she would have been able to manage both motherhood and writing her dissertation without having additional childcare help.

It is surprising that NUES, an Education school that is female-dominated in terms of students and professors, does not provide childcare for the many doctoral students who are also mothers. One explanation is that NUES, in its quest for legitimacy, has adopted a more masculine culture which does not recognize and support the dual role that NUES doctoral students, many of whom are of childbearing age, as both student scholars and parents. The lack of a supervised childcare center for doctoral students is are a reflection of its underlying culture about what is expected of doctoral students, which is that childcare is the sole responsibility of the doctoral student. Perhaps NUES is unaware of how this negatively affects degree progress, and especially for women, who more often take on more responsibility for childrearing duties than men in heterosexual relationships.

Not surprisingly, having children and/or the desire for motherhood was never mentioned by the Engineering women as a factor affecting their experience or degree progress, probably because most of the women were single, unmarried, and in their early to mid–twenties which is a life stage where their sole focus was on being a full-time doctoral student. Many of the NIES women decided to pursue their doctoral degrees either immediately or within a couple of years of completing their undergraduate degree because they knew this was the time in their lives when they would be able to pursue

doctoral study full time without the other commitments of marriage and a family. However, when I asked about childcare on campus, the women mentioned that childcare was readily available to post-doctoral students. When I looked at the Northeast Institute website, Northeast Institute just started a pilot program which provides subsidized childcare for undergraduate and graduate students as well as on-campus childcare centers.

This is an example of how the Engineering culture sustains the normative gender schema of masculinity – in order to be successful as doctoral students in Engineering, the women must conform to masculine gendered expectations which means that they are not, and should not, be responsible for bearing and caring for children, which is often the expectation for men. The Engineering culture shuns this type of behavior in the implicit cues that women observe from other more advanced peers as well as the faculty in Engineering. The women's reluctance to have children while pursuing their doctoral degrees thus reinforces, and thus sustains the masculine gender schemas surrounding the expectation that the doctoral women are supposed to dedicate themselves full-time to doctoral study and not entertain child bearing and rearing until after they complete their degrees.

On the other hand, the gender schema in the Education doctoral culture is such that it is more welcoming of the Education women bearing and rearing children while enrolled in the doctoral programs. However, the doctoral programs in Education at NUES are not structured to support doctoral women who are mothers as evidenced by the lack of on campus childcare services available to doctoral students who are mothers. Thus, even though it is acceptable for the Education women to have children and be responsible for taking care of those children, the gender schema shaping Education doctoral culture is

one that reflects masculinity, because like men, the women are expected to prioritize their professional role as doctoral students over their role in the home as mothers if they want to be successful in doctoral education. An example of this masculine gender schema is the implicit message that the Education doctoral women receive from their doctoral department that says "yes, it's okay to have children, but still submit the paper by Monday." Because focusing on full-time doctoral study is the expectation of Education women, they are left to their own devices to figure out how to balance the demands of being a doctoral student with being a mother.

Societal sexism was a unique challenge cited by two or three of the 11 Engineering women, but overall most of the Engineering women did not perceive that sexism to be an issue that overtly challenged their degree progress. Most of the women did not verbalize and therefore acknowledge instances of institutional sexism because most of them were unaware of the ways in which the Engineering doctoral culture in their department at NIES reflected and reinforced masculine gender schemas of proactivity, independence, competition, and objectivity as characteristics for success. On example of a masculine definition for success is the NIES departments' expectation that Engineering doctoral women "dare not" have children while in graduate school. For the Engineering women, this expectation is part of the masculine Engineering and professional culture, and yet the women might not be conscious that this "dare not have children" while in graduate school expectation is precisely sexist in that it penalizes women more so than men because of the physiological demands bearing children places on women. The "dare not" have children expectation reflects an underlying gender schemas of masculinity because like men, women must devote themselves to only their doctoral study and should

not be engaging in activities, like child bearing and rearing, that would take their attention and time away from graduate school. This is because doctoral education culture in Engineering reflects professional culture, and professional culture is today's organizations is one that is still based on masculine norms for behavior (Acker, 1990/1992; Britton, 1990; Glazer-Raymo, 1999; Valian, 1999).

Regardless of whether sexism is explicitly perceived within the institution as was the case with Sara in her Civil Engineering department, or whether it is experienced outside of the institution by society, as was the case with Heather and Madelyn when consulting with external Aero-Astro Engineering agencies, or the sexism is implicit and intertwined into the masculine schemas within the culture of Engineering at NIES, sexism is still sexism. Sexism is a barrier that many women and girls have to deal with when studying Engineering and the sciences due to historical and societal perceptions about women's competence and ability to study these fields (Martinez Aleman & Renn, 2002; Thelin, 2004) and the "gender" of SEM knowledge and who can be Engineering professionals (AAUW, 2008; Code, 1991; Glazer-Raymo, 1999; Hartman & Hartman, 2008). Most of the women were not consciously aware of the ways in which the existence of sexism in Engineering doctoral culture affects their confidence, doctoral experience, and degree progress, because these have been successful in Engineering up until this point in spite of sexism. The Engineering women at NIES have been successful in their doctoral programs in Engineering because they have internalized masculine gender schemas deeply rooted in Engineering culture as the norms for success. This may be why many of the Engineering women were not conscious of the ways in which

Engineering culture contains elements of sexism – they see these sexist beliefs, values, and expectations for behavior as the normative.

Summary

This chapter addressed the three research questions that guided this dissertation which aimed to understand the gendered environment of doctoral education in Education, a female-dominated field, and Engineering, a male-dominated field, and how these environments shaped women's doctoral experiences, and in turn women's differential degree completion rates in each field. The next chapter will focus on two major conclusion of this dissertation, how they align or do not align with the existing literature about women doctoral students' experiences and degree progress, and implications for how doctoral education in Education and Engineering can learn from each other's successes and obstacles. Implications for the theory, practice, and future research of doctoral education in Education and Engineering are important for raising awareness among students, faculty, administrators, and policymakers and effecting appropriate change to improve the doctoral experience and degree progress for women in these two fields

CHAPTER EIGHT: CONCLUSIONS AND IMPLICATIONS

The findings of this dissertation suggest that it is not such a wonderful world for women doctoral students studying Education, a prototypically feminine academic field, and that the climate for women studying Engineering, a prototypically masculine academic field, is not as "chilly" as much of the literature about women in SEM fields would suggest (Ferreira 2002/2003/2010; Glazer-Raymo, 1999; Hall & Sandler, 1982; Litzler, Edwards Lange, & Brainard, 2005; Martinez Aleman & Renn, 2002; Nettles & Millett, 2006; Ulku-Steiner, Kurtz-Costes, & Kinlaw, 2000). There are many complexities in implementing changes in the culture and structure of doctoral education in Education and Engineering to improve women's experiences and degree progress. As such, this chapter will focus on the summarizing the three most salient conclusions which in turn will inform the implications: 1) The "hidden curriculum" of doctoral education reflects more masculine gender schemas which is why doctoral education is not perceived as a supportive environment for women by either group; 2) The Engineering women reported more positive doctoral experiences and fewer barriers to degree progress than the Education women because of the nature of the financial support, research structure, and the advising relationship. 3) Peer collaboration, a feminine gender schema, is a key source of support for women in both Education and Engineering, and yet collaboration was more apparent in Engineering, a traditionally masculine field, than in Education, a traditionally feminine field. Based on these conclusions, I provide recommendations for faculty, administrators, and students to guide how doctoral education in Education and Engineering can be re-conceptualized, delivered, and researched in the future. These recommendations call for the incorporation of more feminine gender schemas such as

flexibility and collegiality/collaboration into doctoral culture in order to promote and achieve equity.

Conclusion 1: Doctoral Education Culture Reflects More Masculine Schemas

Doctoral education culture in both Education and Engineering exhibited more masculine gender schemas than feminine ones, which is why both groups of women perceived the doctoral environment as not supportive for women. However, feminine gender schemas were more apparent in the culture of Engineering, a traditionally masculine field, than in the culture of Education, traditionally feminine field.

When asked about to describe the culture of doctoral education in their respective fields, the NUES and NIES women describe the culture as valuing proactivity, independence, and competition, which are consistent with masculine gender schemas (Bem, 1981; Valian, 1999). These characteristics of doctoral education are masculine in that they are more often associated with men and reflect male definitions of success – that is to be a successful doctoral student, a person must be proactive, highly independent and competitive. It is not surprising then, that the Engineering and Education women did not perceive this culture to be supportive for women because doctoral education, as a reflection of the academy, is one that contains gender schemas that are more consistent with masculinity --rationality, objectivity, hierarchy, independence and autonomy, productivity. This is probably because doctoral education reflects the culture of the academy, an institution which was initially developed by and continues to be dominated by men at the highest levels (Martinez Aleman, 2008; Tong, 2009).

Even though more masculine gender schemas were emphasized, both groups of women also used the words "flexible" and "collegial" to describe doctoral education. These are more consistent with feminine gender schemas because they reflect characteristics that are more commonly associated with women, such as emotion, community, dependence, and connection (Martinez Aleman, 2008; Tong, 2009). However, in comparing the doctoral environment in Engineering and Education, the feminine gender schemas of flexibility, collegiality, and collaboration were more apparent in the doctoral education culture in Engineering, a field and profession that is perceived to be "masculine", than doctoral education culture in Education, a field and profession that is perceived to be "feminine" (AAUW, 2008 Martinez Aleman & Renn, 2002). For example, it was common for the Engineering women to collaborate with their peers, specifically advanced peers on their dissertation research, and the NIES women mentioned how collegial and supportive their doctoral departments were of their success, especially as women. This finding contradicts most of the existing literature about SEM fields as "chilly" and environments that lack traditionally feminine gender schemas of collaboration between faculty and peers (COSEPUP, 2007; Ferreira, 2002/2003/2010; Hall & Sandler, 1982). Additionally, the NIES women did not experience these socio-cultural barriers that women in SEM fields typically experience such as societal doubts about women's ability to pursue advanced degrees in science and engineering (Martinez Aleman & Renn, 2002; Thelin, 2004).

Instead, this research shed light on the "not so wonderful world" of women's doctoral experiences and degree progress in Education. The NUES women perceived that their opportunities for socialization were less positive and were less satisfied with the

quality of their doctoral experience than the NIES women and the few studies about gender differences in doctoral programs in Education corroborated this feeling (Nettles & Millett, 2006; Watford, 2007). Women's slightly higher likelihood of completing doctoral degrees in Education in comparison to men (54% of women vs. 49% of men) would suggest that doctoral experiences and degree progress are not a problem for women in Education. However, the findings in this dissertation refute the assumption that there is no reason to be concerned about women's experiences and degree progress in Education. The reason why women in Education continue to struggle is because doctoral education emphasizes masculine gender schemas. This matters for women because women experience this masculine doctoral education culture differently, which the literature suggests may explain differences in degree progress and completion (Gardner & Mendoza, 2010). Thus, it is not surprising that both groups of women struggled with reconciling these masculine gender schemas with their feminine gender schemas. In order to be successful in doctoral education, both groups of doctoral women had to adopt masculine gender schemas – that is be proactive, independent, and competitive. However, both groups of women expressed uncertainty with being proactive and independent in a flexible environment, probably because women are socialized to wait to be told what to do.

The 21 doctoral women both agreed that their department and program culture was not supportive of women or men, but yet they did not expect doctoral education culture and structure to be supportive. Although departmental and program culture and structure inevitably affected the nature of the women's doctoral experience and degree progress, both groups of women said that it was NOT the doctoral department or

program's responsibility to provide a supportive environment for degree progress, although they mentioned it would be nice!

In sum, the findings in this dissertation debunk much of the existing research about the "chilly climate" for women doctoral students in Engineering, because overall, the Engineering women at NIES reported more positive doctoral experiences and experienced fewer challenges to degree progress than the women at NUES. These findings suggest that it is the gendered schemas, or underlying beliefs, values, and expectations of men and women, which are reflected in the culture and structure of the doctoral department and program, that explain women's differential doctoral experiences and degree progress in Education and Engineering. The NIES environment may provide a more positive experience for the doctoral women because it reflected gender schemas that incorporated to a larger degree more feminine gender schemas such as collaboration, collegiality, and community into the departmental culture and structure. As a result, it will behoove doctoral programs in Education and Engineering to adopt and inculcate both masculine and feminine gender schemas into the way that doctoral education is conceptualized, delivered, and researched with the goal of promoting and maintaining gender equality in the two fields.

Conclusion 2: Better Experiences and Degree Progress in Engineering

The Engineering women reported more positive doctoral experiences and fewer barriers to degree progress than the Education women because of the nature of the financial support, research structure, and advising relationship.

Overall, the 21 women I interviewed at NUES and NIES reported relatively positive doctoral experiences, since all of them continuously enrolled in their doctoral

programs and continued to make steady progress toward earning their degree. Comparing the two groups of women, the Engineering women appeared to have more positive doctoral experiences and fewer barriers to degree progress than the Education women because of institutional factors, rather than individual factors, which is consistent with the existing literature (Bair & Haworth, 1999/2004; Barelson, 1960; CGS, 2009; Lovitts, 2001).The prominent institutional factors examined in this dissertation are financial funding, the faculty advisor, and the department and program environment – cited in most of the large scale studies on degree completion and attrition (Bair & Haworth, 2004; CGS, 2004/2007/2008/2009).

Financial funding is an important institutional factor that affects doctoral degree progress, and the funding structures affected the Education and Engineering women's experiences and degree progress differently (Abedi & Benkin, 1987; Bowen & Rudenstine, 1992; CGS, 2009; Lovitts, 2001; Maher, Ford, & Thompson, 2004; Moyer, Salovey, & Casey-Cannon, 1999; Nettles & Millett, 2006). The Engineering women were well funded throughout their doctoral programs which enabled them to focus their time on their dissertation research and their one part time job as s a research assistant in the lab. Because they worked on their dissertations starting the first semester as part of their research activities in the lab, almost all of the women expected to complete their degrees on time. In contrast, every single one of the 10 NUES Education women were concerned about the level and type of funding available which is common for the Education field where less than half of all doctoral students are offered an assistantship (Nettles & Millett, 2006). Most NUES women worked between three and five part-time jobs each year, often as teaching assistants, to earn enough money to afford to live in the area. The

NUES women complained that their teaching got in the way of their degree progress because it meant they had less time to work on their dissertations, which is consistent with the literature on the negative effect of teaching on degree completion (Sallee, 2008; Seagram, Gould, & Pyke, 1998).

Differences in the nature of the doctoral experience and degree progress for Education women at NUES and the Engineering women at NIES have to do with the nature and structure of the research community within each field. The NIES women talked about the how they enjoyed the collaborative atmosphere of their research lab in which faculty and doctoral students worked closely together. The research environment at NIES intentionally fostered social interaction. In contrast, the NUES women often felt isolated in their day to day research activities, because the research process was a solitary endeavor. The NUES women reported feeling alone in their department because they did not have many opportunities to interact with other doctoral students and faculty outside the dyadic nature of their relationship with their dissertation chair. This finding is consistent with the literature about the research mode of the sciences providing a more supportive environment than non-science fields (Nerad & Cerny, 1991; Ferrer de Valero, 2001; Nettles & Millett, 2006). The existing or lack of multiple opportunities for socialization is especially crucial because it influences a student's decision to stay or leave their doctoral programs; thus research modes that foster frequent socialization opportunities, like the lab format in Engineering, are more supportive of doctoral student persistence than research modes, like the traditional one-on-one apprenticeship structure in Education, in which doctoral students have fewer opportunities to socialize into the disciplinal and departmental community (Bair & Haworth, 1999/2004; Barelson, 1960;

Bowen & Rudenstine, 1992; Girves & Wemmerus, 1988; Golde, 2000; Golde, 2005; Lovitts, 2001; Nerad & Miller, 1997).

The reason why Engineering women reported more positive doctoral experiences and progressed more quickly in their doctoral programs was because they were more satisfied with their relationships with their faculty advisors. These positive advising relationships were ones in which the advisors were highly accessible and interacted with the student in person on a regular, if not weekly, basis, and provided all three types of help needed by doctoral students: instrumental, emotional, and networking help. This finding is aligned with the existing literature as these types of relationships are correlated with high academic performance and student satisfaction (CGS, 2009; Girves & Wemmerus, 1988; Golde, 1996/2000; Paglis, Green, & Bauer, 2006; Tenenbaum, Crosby, & Gliner, 2001). The Engineering women perceived their advisors as accessible and invested in their research because their faculty advisor simultaneously served as the primary investigator in the research lab; thus, doctoral students worked side by side with their faculty advisors on common research interests and projects on a daily basis.

On the other hand, the Education women reported less positive experiences and more challenges to degree progress in part because their faculty advisors were less available and interested in their research interests because the Education women did not have the time nor the opportunity to interact with their faculty advisor due to the conflicting demands of their three to five part-time jobs and their dissertation research. Also, there was often a mismatch between the research interests of the Education women and their faculty advisors, which is one of the reasons why doctoral students may leave their doctoral programs (CGS, 2009; Golde, 2000/2005; Golde & Dore, 2001; Nerad &

Miller, 1996). As a result of this mismatch in personality, work style, and/or research interests, many of the Education women struggled to form meaningful relationships with their advisors who did not have the time or the interest to invest in their advisee's professional and personal success. Because of the dyadic nature of the advising relationship, the NUES women did not interact frequently with their faculty advisors other than meetings specifically designed to address the women's dissertation research. Also, because most of the faculty only had experience in academia, faculty advisors were ill equipped to provide career advice and support half of the Education women who were considering pursuing a non-academic career, which is often the case in the Education field (Nettles & Millett, 2006).

The degree of match between a doctoral student and his or her faculty advisor is of particularly importance because it has implications for whether a student will stay or leave a doctoral program (Golde, 2005). For the Engineering women at NIES, the student-faculty advisor matching process was much more intentional and determined during the first semester when doctoral students and faculty are matched to a research lab. The faculty advisor process is less intentional for the Education women at NUES because faculty advisor assignment is in flux, as NUES women had more flexibility to change advisors as their research interests crystalized during doctoral study. Considering that of women both groups of women indicated that their advisor was the most critical part of their doctoral experience and their ultimate degree completion, the idea that having a "good" advisor is left to chance rather than intention is problematic, given the critical role that advisors play in doctoral degree completion (Austin, 2002; Bair & Haworth, 1999/2004; CGS, 2009; Ferrer de Valero, 2001; Golde & Dore, 2001). Considering that one of the major themes in

Chapter Six is that finding a great advisor is a matter of "luck" at NUES and NIES suggests that doctoral department faculty and administrators should be more intentional about how they "match" students with advisors whose personalities, research interests, and work style are a good fit. Of course, the matching will depend upon the tenure status of the individual faculty member, but perhaps faculty with tenure should take on more advising responsibilities than junior faculty seeking tenure. so that having faculty advisors who are accessible and truly invested in the success of their advisees becomes the norm, and not the exception

Conclusion 3: Peers Are Most Important for Facilitating Degree Progress

Peers, in particular advanced peers, were the most important source of support for both Education and Engineering women's degree progress because peers took on the role of faculty advisor for those students who had poor faculty advisor relationships. Peers were mentioned by both the Education and Engineering women as the most important source of support for their degree progress, even more important than the faculty advisor. This was the case because doctoral peers often fulfilled the role of the faculty advisor when the faculty advisor was unavailable. Doctoral students consulted with more advanced peers who could provide the instrumental, psychosocial, and networking help that constitutes effective advising (Tenenbaum, Crosby, & Gliner, 2001). The Engineering women at NIES reported that they had more opportunities to interact with advanced peers because they worked with advanced peers, including post-doctoral students, on an everyday basis in the research lab, and this peer interaction was initiated and encouraged by the doctoral program and department. The Education women interacted with their peers less frequently and this interaction typically

took place during the coursework phase of the doctoral program and became less frequent during the qualifying exam and dissertation development phase of their doctoral programs. The Education doctoral students had to initiate meetings and gatherings with their peers, as it was not something that was explicitly encouraged by the doctoral program or department.

The primary importance of peer support to both the Education and Engineering women interviewed in this dissertation study does not align with the existing literature which cites funding and the advisor as the two most important factors influencing the doctoral experience and degree completion (Bair & Haworth, 2004; CGS, 2004/2007/2008/2009; Nettles & Millett, 2006). Nevertheless, the peer environment is still important, and was the third most important institutional factor, after financial support and advising, cited by 40% of doctoral students completing their degree (CGS, 2009). This conclusion sheds light on the critical importance of promoting a collaborative environment conductive for frequent peer interaction in order to improve women's experiences and degree completion in both Education and Engineering. This is particularly important for Education, because the way that doctoral education in Education is currently structured is not conducive for frequent peer interaction.

Implications for Theory and Practice in Doctoral Education

My goal in sharing these findings and interpretations throughout chapters four, five, six, and seven is to shed light and raise consciousness among doctoral students, faculty, and graduate student administrators about the gendered environment of doctoral education in Education and Engineering and the ways in which doctoral department and program culture and social structure affects the doctoral experience, and in turn, doctoral degree progress. The ultimate implication of this consciousness raising is for doctoral

degree-granting institutions in these two fields to institutionalize changes to how doctoral education is conceptualized, delivered, and researched in order to continue to support women's success and ensure gender quality in terms of the quality of the doctoral experience and timely degree progress and completion. This dissertation research challenges current theoretical assumptions about the purpose of doctoral education and the intellectual inquiry and knowledge generation process. In practice, this research informs graduate student faculty and administrators about how best to support women's doctoral degree progress and safeguard against the common barriers to persistence and completion within the context of the department and doctoral program culture, a critical influencer which institutions can directly control. Comparing two highly prestigious doctoral programs in Education and Engineering enables NUES and NIES, as well as other institutions offering doctoral degrees in these two fields, to learn from each other's successes and obstacles. What follows are recommendations for revisiting the theoretical assumptions behind doctoral education, and in turn what new theoretical assumptions would mean for its delivery.

Recommendation for Theory #1: The purpose of the research doctorate should be more flexible and comprehensive to accommodate both academic and non-academic career paths of doctoral students. The focus should be on developing valuable skills and competencies rather than accumulating narrowly-focused experiences.

Of the 21 Education and Engineering women that I interviewed, approximately half (10) expressed uncertainty about their future career paths; many of the women who were uncertain did say that they did not want to pursue an academic career because of high pressure to publish and the competitive academic job market, and they were unsure

as to what other career options were possible besides an academic one. This grew out of concern that the activities they performed as research and teaching assistants would only be relevant for an academic career. Given the diversity of career goals and the fact that many doctoral student pursuing research-doctorates may not be certain of their future career path and the role that research will play in that career path, the purpose of doctoral education should not be so narrowly focused on socializing students into the academic profession.

Golde and Walker (2006) at the *Carnegie Initiative for the Doctorate* proclaimed that the purpose of doctoral education is to prepare stewards of the discipline, and that this stewardship requires both skills and principles. Thus, in theory, the purpose of doctoral education, especially in fields like Education and Engineering whereby two-thirds of graduates do not pursue academic careers, should focus on the development of critical skills and principles necessary for success in the profession of stewardship, both inside and outside academia (Nettles & Millett, 2006). Consequently, the goals and objectives upon which doctoral education is assessed should be skills and principles-based as it relates to research. Examples of skills-based outcomes for doctorate-holders might include: creative inquiry, strategic thinking, critical analysis and argument, collaboration, project management, problem solving, decision-making, and effective communication. Principles might include the moral and ethical values that are necessary for success in a particular profession or field.

Recommendation for Practice #1: Incorporate flexibility into the doctoral curriculum by providing opportunities for practical application in the form of "rotating" research experiences and/or an internship component.

When asked if and what they would change about the structure of their doctoral program in Education at NUES, some of the women said they thought their graduate program should provide more opportunities to get practical experience in Education, especially for those women who were not interested in pursuing academic careers. They complained that even with the flexible structure, much of their training was too focused on either research or teaching activities and preparing to become faculty members and had little application to the practice of Education. Some women were unsure of what type of career they could pursue outside of academia after earning the doctorate because they did not feel that they currently had gained applicable experience in for example educational administration, leadership, or policy, and partly because there is a separation that exists between research doctorates and more practice-oriented doctorates in Education. In practice, doctoral education in both Education and Engineering can create opportunities for both researchers and practitioners to work alongside one another and learn from one another. One of the NUES women suggested in the focus group that "you can build infrastructures to support it [collaboration between research and practice] . . . what that means is making friends with people . . . create dialogue and conversation between the two." The women expressed a desire to build a collaborative environment where they can gain both research and practical experience, and use the former to inform the latter, and vice versa.

When asked if and what they would change about the structure of their doctoral programs in Engineering, the NIES women said they wished that they had more flexibility to gain multiple research experiences before having to choose a research lab. Most of the doctoral students were assigned to a research lab either immediately upon admission or after a couple of months of rotations. This meant that doctoral students had to commit to a research project and dissertation topic during their first semester which they would then work on for the next four to five years. Currently, the research experience in Engineering is tied to specific professors and the research grants they are able to secure. The NIES women discussed the possibility of changing the research experience so that instead of being project or research grant-centered, the women prefer the research projects to be structured around a sub-specialty within Engineering. This way, doctoral students would have flexibility to pursue a range of research projects within their desired sub-specialty and therefore can explore multiple options before settling on a topic to write about for their dissertation.

Recommendation for Theory #2: The intellectual inquiry and knowledge production process inherent in the dissertation is a collaborative, rather than autonomous, process.

Doctoral education and programs in American higher education can take many forms, but the focus of this dissertation is on research-intensive doctoral programs that require doctoral students to conduct empirical research and contribute new knowledge to their field in the form of a doctoral dissertation or thesis. The underlying assumption that shapes the culture and structure of contemporary research doctorates is that intellectual inquiry and the production of new knowledge is an independent and autonomous process,

rather than a collaborative one. However, the existing literature on doctoral degree progress talks about the importance of peer support and collaboration for a positive doctoral experience and timely degree completion (CGS, 2009; Ferrer de Valero, 2001; Girves & Wemmerus, 1988; Golde, 2000; Golde, 2005). In addition, the 21 Education and Engineering women interviewed in this dissertation identified doctoral student peer support, and specifically from more advanced doctoral students, as the most important facilitating factor for their degree progress. Because of the current autonomous structure of doctoral education and the competitive academic job market in general, many of the women struggled to reconcile two concurrent values of collegiality and competition by using their peers as an avenue for encouragement and support while succeeding individually. However, the reality is that when some of these women enter academia as junior faculty, they will collaborate with their faculty peers to create and transmit new not generate new knowledge instead of independently. Thus, the current assumption that intellectual inquiry and the generation of knowledge must be an autonomous process is not well aligned with the reality of today's contemporary workplace which is that intellectual and knowledge production is collaborative and social process. This is the case for faculty in academia, as well as researchers, engineers, educators, administrators, policymakers, and consultants in other professional environments. Thus, the idea of intellectual inquiry, research, and the generation of new knowledge should include opportunities for doctoral students to collaborate with one another as well as faculty.

Recommendation for Practice #2: Restructure the Research Environment to Ensure Greater Collaboration

Both groups of women discussed the independent nature of scholarly research and the feeling of isolation they sometimes felt while working in the library or in the lab all day. These feelings of isolation were especially a challenge for the Education women who did not have a lab of doctoral peers with whom they could commiserate. Thus, to curb this common feeling of isolation and given that in most professional environments, doctoral students will work with other people to generate new knowledge, the physical structure of research process can be altered to create "lab space" for doctoral students to engage in intellectual inquiry. Institutions can identify and create communal work spaces for doctoral students within the department, similar to a "lab" where doctoral students within the same department can convene and work together on their individual dissertation research projects. This space can also include offices for doctoral students who are TAs to meet with the students that they teach in a confidential, private area. Creating a common space dedicated to doctoral students is a way for doctoral departments to communicate the idea that they truly care and are invested in facilitating the success of their doctoral students.

Another way to incorporate collaboration into the curriculum is to restructure the format of the dissertation so that two or three doctoral students work together to pose interesting research questions, conduct the background research, collect and analyze the data, interpret the findings, and communicate those findings in the form of a dissertation. Each doctoral student in the "group" would still be responsible for demonstrating mastery of the subject matter and defend his or her arguments to a dissertation committee but does

so within the context of the small group. This structure is more aligned with what is expected of doctoral students in both academic and non-academic professions because it requires applying research to practice. This approach is already being implemented in graduate schools of Education that offer professional doctorates in Education to prepare educational administrators. Only a few doctoral programs in the United States offer a collaborative dissertation formats, but these programs recognize that the knowledge generation and dissemination is a collaborative process, both in academia and in educational practice (Guthrie, 2009; Murphy & Vriesenga, 2005).

I suggest that this collaborative dissertation format which integrates the dissertation throughout the doctoral program instead of as an "after thought" after coursework will help improve time to degree and combat the isolation that many doctoral students feel when in the dissertation stage (Murphy & Vriesenga, 2005). A dissertation process which is collaborative in design and intent will enable doctoral students to generate and transmit new knowledge together, as stewards of both theory and practice within their discipline or field. A group dissertation inquiry format ultimately may facilitate degree progress and decrease time to completion, due to the critical support that doctoral peers provide throughout the doctoral experience.

The two recommendations previously provided for practice are general in the sense that both Education and Engineering doctoral education can benefit from incorporating feminine gender schemas of flexibility and collaboration into its culture and structure in order to improve the doctoral experience and facilitate degree progress for women. However, the Education doctoral programs at NUES are currently doing a better job at incorporating flexibility into its program structure than Engineering. Thus,

Engineering can learn from Education's flexibility. Conversely, Engineering doctoral programs at NIES are currently doing a better job of providing opportunities for collaboration in the way the research community is structured, and thus Education and learn from Engineering's culture of collaboration. Specific recommendations for structural changes in Engineering and Education doctoral education are provided below.

What Can Engineering Doctoral Education Learn from Education?

Build more flexibility into the Engineering doctoral program curriculum structure by creating "research rotations" and incorporating an industry internship component.

Currently, the funding structure in Engineering is tied to one research lab and project for the five or six years of their doctoral degree program, and students choose a research lab, funded by a federal or corporate research grant, as first semester doctoral students before they have a chance to really know if they like the research project. Thus, Engineering students only get experience in one research lab throughout their doctoral experience. Engineering can learn from the more flexible research structure in Education by enabling doctoral students the opportunity to diversify their research experience by working in more than one research lab instead of being "locked in" to one research lab so early in their doctoral programs. In Education, doctoral students have the flexibility to diversify the type of experiences they have because their funding is not tied to one particular faculty advisor. While I understand that the Engineering funding structure is determined by the specific research grant and cannot be easily disaggregated from the faculty advisor to whom the research grant is awarded, Engineering could benefit by having the department fund doctoral students for the first year only, which is the case in

Biological Engineering at NIES. During the first year, doctoral students would participate in "research rotations" similar in structure and timing to that of medical school residency rotations. First-year doctoral students would rotate labs every three months during the first nine months in the doctoral program where they would gain sufficient exposure to a three different research projects that interest them. Instituting a first year "research rotation" structure will enable doctoral students to have more flexibility when choosing a research project, and in turn a faculty advisor for the dissertation since doctoral students are choosing their dissertation research topic when they choose their research lab. Because the faculty advisor relationships is so critical to the doctoral experience for Engineering students due to the long-term commitment required of most research grants, it is important than Engineering doctoral students, and the faculty advisors who serve as the primary investigators in the research lab, have the opportunity to figure out whether their research interests, work styles, and personalities are a good fit before committing to one another over the life of the research grant. At the conclusion of the first-year, doctoral students would then participate in a mutual selection process whereby faculty and doctoral students provide their preferences for research assistants and research labs/faculty advisors, respectively, whom they will commit to working with for the next three or four years in the doctoral program.

Another way to build in flexibility to Engineering doctoral programs, is to develop an internship component into the doctoral curriculum which would provide opportunities for Engineering to gain practical experience in Engineering industry. Incorporating industry opportunities is a necessity considering that on average, two-thirds of Engineering doctoral students pursue careers in industry after completing their

doctorates (Nettles & Millett, 2006). These practicum experiences would provide opportunities for doctoral students to apply their skills to solve real-world problems in their communities and develop critical networks with other Engineers which will be valuable for re-entry into Engineering industry.

What Can Education Doctoral Education Learn from Engineering?

Intentionally design the curriculum and research structure to be more collaborative by incorporating peers as a mechanism for facilitating degree progress.

The Education women wished that their doctoral program was structured in a more intentional way so that they could benefit from the experience and complete their degrees quickly. Specifically, doctoral education in Education should re-visit its course offerings and the research community structure because these two factors were key challenges to experience and degree progress for the Education women, but were facilitating factors for the NIES women. The NIES doctoral students were able to take all different types of methodology courses currently available across Northeast Institute, which were primarily quantitative since the research questions asked in Engineering often require quantitative methods to be answered. Even though the same was true for the NUES women at Northeast University, the women complained that Northeast University simply did not offer enough diversity in qualitative methods courses within NUES which lend themselves for answering the types of questions that are asked in the Education field. In essence, the Education doctoral program does not provide these women with the tools to answer these questions, and in essence is almost setting them up for struggle. If doctoral students are positing interesting questions that require specific qualitative methodologies, then the NUES faculty and the administration should work to find faculty

who specialize in those methodologies in order to provide their students with the tools they need to answer those interesting questions they are passionate about.

Education can also learn from the success of the "lab structure" in Engineering as an avenue for redesigning how doctoral students conduct research as well building community among doctoral students and faculty in Education. In Engineering, the doctoral students worked together in a lab and also there were dedicated workspaces within or next to the lab for doctoral students to work on their research projects, together. Education might benefit from incorporating a similar structure whereby multiple doctoral students work as research assistants as part of a "lab" guided by a research grant pioneered by a team of faculty, doctoral students, and post-docs who work in these labs. The physical structure of these Educational research labs can consist of work stations where all can congregate and work together on their research projects which simultaneously serve as the basis of their dissertations, which would be completed in groups of two or three students as described above. There may be challenges with instituting this research team/lab structure due to the nature of how Education doctoral students are funded. It is more difficult for Education faculty to receive federally funded research grants to fund these doctoral students, so it could be that the department puts together research teams of faculty and doctoral students who might have similar research interests but are funded through different financial sources (e.g. department vs. external grants). At the very least, Education can benefit by creating a "lab" in the structural sense which is a common work space where doctoral students to come together and work on their research, whether it is funded on the same research grant or not.

The NUES women said they wanted NUES to create more office space on campus dedicated to doctoral students, especially teaching assistants who needed that space to meet with students. Building both communal and private workspaces for will intentionally benefit doctoral students' needs for peer interaction and support throughout the doctoral experience, especially during the dissertation phase. Also, the dissertation development process in Education doctoral programs can be more intentionally designed, like it is in Engineering, so that doctoral students begin working on their dissertation research in their first semester.

In sum, doctoral education in Education and Engineering can benefit by incorporating more feminine gender schemas of flexibility and collaboration into the way that doctoral education is conceptualized and practiced in order to improve the quality of the doctoral experience and degree progress for women in both fields. Engineering can learn from Education's flexible program structure by providing opportunities for doctoral students to gain a diverse set of experiences in research, teaching, and industry. Education can learn from Engineering by creating more collaborative spaces dedicated to doctoral students and redesigning the dissertation research structure to encourage peer collaboration as peers are critical to doctoral students' success in both the Education and Engineering fields. Last but not least, future research is needed to better understand the role of gender schemas and doctoral culture in explaining the commonalities and unique differences in women's doctoral experiences and degree progress in highly gendered fields like Education and Engineering.

Implications for Future Research

This dissertation research underscores the importance of gender schemas and the role of the gendered culture and structure of doctoral education in explaining women's differential doctoral experiences and degree progress in Education and Engineering. One of the limitations of this dissertation is that it focused only on women's perceptions of their doctoral environment, experiences and degree progress at two highly-selective institutions. Thus, the findings only can compare women's perceptions to other women, and little is known about how they compare to male doctoral students' perceptions. Future research about doctoral education in these two fields needs to include male doctoral students' perspectives along with women's in order to identify the similarities and differences in perceived doctoral education culture, doctoral experiences, and degree progress of both men and women enrolled in the same doctoral programs, departments, and institutions. Specifically, future research should examine both men and women's perceptions of their doctoral programs in Engineering as well as Education as two highly gendered fields.

In addition, because one the major conclusions in this study was that women in Education, a prototypically female field reported fewer positive experiences and more challenges to degree progress than women in Engineering, a male-dominated field, more attention needs to be paid to women's doctoral experiences and degree progress in female-dominated fields. Future research is needed to identify additional explanations for why it may not be such as "wonderful world" for women doctoral students in female-dominated doctoral education environments where women constitute the majority of students and faculty. Specifically, more comprehensive studies using quantitative

methodologies are needed to investigate the challenge to degree progress identified in this study such as funding, the isolating nature of the research structure, and balancing the demands of motherhood in other Education doctoral programs, as well as in other female-dominated field such as Nursing, Psychology, and Health Sciences.

Last but not least, there is a dearth of literature about women's experiences in higher education that specifically and explicitly uses critical feminist theory and gender schemas as a lens for analysis. More critical feminist methods of inquiry are needed in order to raise consciousness of the ways in which gender schemas shape society's expectations for women and men in the professions and in higher education (Ropers-Huilman & Winters, 2011; Tong, 2009). Future studies should compare and contrast women's experience in other highly gendered fields such as Nursing, a prototypically female field, and Economics, a prototypically male field in order to shed light on how these environments differentially affect women's experiences and degree progress in comparison to Education and Engineering. Raising consciousness of the ways in which the doctoral environment affects women and men is important for effecting change in doctoral education that will equalize access to, experience in, and completion of doctoral education for women, as well as for other oppressed groups such as students of color, and lesbian, gay, bisexual, and/or transgender students.

Final Conclusion

In order for doctoral education in Education and Engineering to achieve gender equality in the quality of the doctoral experience and degree completion, the underlying theoretical assumptions of doctoral education, how doctoral education is delivered and practices, and the topics necessary for inquiry need to be re-examined to incorporate

more feminine gender schemas which value women's ways of knowing and learning into both the culture and the structure of doctoral education (Code, 1991). Critical feminist theory is a necessary lens through which researchers should examine women's access to, experience in, and completion of doctoral education and overall success in both academic and non-academic professions because it places gender and its societal constructions as a lens through which we can interpret lived experience. The American 21st century economy is changing and is requiring that doctoral education prepare its students for a diverse array of possible career paths, recognizing that academia is just one possible career path. I look forward to the day when women represent 50% of the positions of power in the Education and Engineering fields as full professors, educators, engineers, corporate leaders, administrators, and policymakers in American society so that it is commensurate with women's status as the majority of undergraduate, master's, and doctoral student enrollments and degree recipients.

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Appendix A: Interview #1 Protocol

1. Check the recording equipment for proper functioning before the interview

2. Introduce myself to the doctoral student, thank her for volunteering to participate, and explain the purpose of the interview.

3. Review the informed consent form which has been approved by Boston College's human subject review board.

4. Obtain the participant's signature on 2 copies of the consent form (1 copy for researcher, 1 copy for participant)

5. Explain the interview process
    a. The purpose of this interview is to learn about your educational background and experiences prior to pursuing doctoral study (Interview #1).
    b. The purpose of this interview is to learn about your current experiences as a doctoral degree student in Engineering/Education at your institution (Interview #2)
    c. (Both Interviews): You do not have to answer a question if you do not feel comfortable doing so, and we can stop the interview at any time if you feel uncomfortable or do not wish to continue.

6. Explain the recording process
    a. To facilitate data collection, I would like to digitally record our conversation today. I am the only one who will have access to these records, which will be stored in a secure file until they are transcribed. Once the interviews are transcribed, the original audio files will be destroyed. May I have your permission to record?

7. Begin recording

Interview #1 Guide

Interviewee Name & Pseudonym:

Interview Date:

Thank you for meeting with me today. The questions for this interview will focus on two major areas. First, I will ask you about your educational and professional background prior to pursuing doctoral study. Second, I will ask about your initial impressions of your doctoral program and institution during the first semester as a doctoral student at your institution.

Note: Since this is a semi-structured interview, the following questions will be used as a guide only. Some questions may not be asked if the participant answers them in previous responses. The interviewer will follow-up with additional questions based on the context of each interview to probe for more detail or clarification if the interviewer believes it is necessary.

Educational Background/Life History

1) Can you tell me a little about yourself?
   a. Where did you grow up?
   b. Who in your life has encouraged you to pursue further education?
   c. What were your career aspirations while growing up?
   d. What experiences led you to decide to go to college?
   e. What experiences led you to decide to attend graduate school?

2) Can you talk about your undergraduate and graduate educational background before pursuing your doctorate?
   a. Where did you go to college and what did you study?
   b. Did you pursue a master's degree before deciding to pursue your doctorate? If so, where did you go to graduate school and what did you study?

3) How confident did you feel about your academic abilities while growing up?
   a. What about in college?
   b. At the time, did you believe you had what it takes to pursue a doctoral degree in Engineering/Education?

4) How did you originally become interested in your chosen field? (Engineering or Education)?

5) How did you decide to pursue a doctoral degree in Engineering/Education?

6) What is your doctoral program concentration within Engineering/Education, and why did you choose to study this specialty?

7) What are your career goals? How do you plan to use your doctoral degree after you are finished?

8) How did you make the decision to come to [this institution] for your doctoral degree?

   a. Follow-up: Did you consider other doctoral degree programs at other institutions?
   b. Follow-up: Why did you choose the doctoral program at [this institution]?

9) What role did others play in your decision to pursue your doctoral degree?

10) Have you experienced any barriers along the way before beginning a doctoral degree? For example, did you have to overcome any challenges while pursuing higher education when you were younger, during college or graduate school?

Initial Impressions

11) What were your initial impressions of [this institution] when beginning doctoral study?
   a. Probe: What was the transition like from your [prior experiences] to beginning doctoral study at [this institution]?

12) What were your initial impressions of the [Engineering or Education department] when beginning doctoral study?
   a. Probe: What did you think of the [Engineering/Education graduate school] when you first enrolled?

13) What were your initial impressions of your doctoral program when beginning doctoral study?
   a. Probe: what did you think of the [name of doctoral program] when you first enrolled?

14) What was it like being a woman when beginning doctoral study at [this institution]?
   a. Did you feel welcomed by your institution and/or department?
   b. What was the transition like during your first semester in the doctoral program at [this institution]?

15) Is there anything else you would like to share with me about your personal or educational background and your initial experiences as a doctoral student?

End Interview:

Thank participant for her time and insights and pay her the first installment ($25 Gift card) for participating. After payment, schedule a second individual interview in the next week to discuss her current doctoral experiences both within and outside the institution.

Appendix B: Interview #2 Protocol

Hello, thank you for meeting with me for our second interview today. During this interview, I will be asking you to talk about various aspects of your current doctoral experiences which will include aspects about your life within and outside doctoral study. If I ask you anything that you do not feel comfortable answering, please tell me that you do not wish to answer the question.

Note: Since this is a semi-structured interview, the following questions will be used as a guide only. Some questions may not be asked if the participant answers them in previous responses. The interviewer will follow-up with additional questions based on the context of each interview to probe for more detail or clarification if the interviewer believes it is necessary.

The following set of questions will ask about aspects of your current doctoral experience, both within and outside your institution.

Current Doctoral degree Experiences

1) Describe a typical day in your life as a doctoral student, from the time you wake up to the time you go to sleep.

a. Probe: what is a typical day like as a doctoral student in Engineering/Education at [this institution]?

2) Financial Support: What kinds of institutional financial support do you have to fund the cost of attendance for your doctoral program? If you have a research assistantship or teaching assistantship, can you describe the nature of your responsibilities?

a. Follow-up: What is the nature of the compensation for your work? How many hours each week do you work?

b. Follow-up: Do you use any personal resources to fund the cost of your doctoral degree program? Or are most of your expenses covered by your institution?
c. Compared to colleagues at different institutions, does your doctoral program provide adequate funding to live in this area?

3) **Student-Faculty Advising Relationship:** Have you had a primary faculty advisor during your doctoral experience? If you are at the dissertation stage, is this person also your dissertation chair?
   a. Describe a typical encounter or meeting with your advisor. (or dissertation chair if at the dissertation stage)
   b. Do you also work for your faculty advisor as a research assistant or teaching assistant? If yes, how does this influence the advising experience?

c. How available is your advisor/dissertation chair, and how often do you meet with him or her?
d. What type of feedback or guidance do you receive from your advisor? Is the feedback and guidance you receive valuable?
e. How satisfied are you at this point with the quality of your relationship with your advisor (or dissertation chair)?
f. How has your faculty advisor (or dissertation chair) influenced your doctoral degree experience? How has your advisor influenced your doctoral degree progress?

4) Discipline/Department Culture:

a. What is the culture of your department like? What are the doctoral students like in your program or department? Do you work well together and are student supportive of each other or are they competitive?
b. What are the faculty like? Are they available in their offices or in the lab? Are you able to ask them questions? How do they generally treat the doctoral students?
c. What is the culture of Engineering/Education as a field like? What do you think are the beliefs and values of the profession?
d. How do these beliefs and values affect you? How do you see the culture of Engineering/Education as a field played out at [this institution]?

5) What are your impressions of your doctoral experience now? Have they changed from when you first began your doctoral degree program?

6) Thus far, we have talked a lot about your academic experiences as a doctoral degree student at [this institution]. Can you tell me a little more about your life outside of doctoral study, in particular your personal and family life?

a. How does being a doctoral student affect your relationship with family?
b. How does being a doctoral student affect your relationship with your spouse/significant other?
c. How does being a doctoral student affect your relationship with your friends?

Wrap-up Questions:

7) Is there anything else about your doctoral degree experiences either within or outside [this institution] that you would like to add or mention?

End Interview:

Thank participant for her time and insights, and give the participant the second installment ($25 Gift card) for completing the second individual interview. Remind the

participant that I will be contacting her to schedule a focus group interview along with other doctoral degree women in Engineering/Education at her institution in the next two weeks.

Appendix C: Interview #3 Protocol

Hello, thank you for meeting with me for our final interview today. During this interview, I will be asking you to reflect back on the first two individual interviews about your doctoral experiences and on the focus group interview with your female colleagues about doctoral culture and how both have influenced your doctoral degree progress. I will also asking about gender, and what these experiences mean for you as a woman. If I ask you anything that you do not feel comfortable answering, please tell me that you do not wish to answer the question.

Note: Since this is a semi-structured interview, the following questions will be used as a guide only. Some questions may not be asked if the participant answers them in previous responses. The interviewer will follow-up with additional questions based on the context of each interview to probe for more detail or clarification if the interviewer believes it is necessary.

Questions:

Reflection: Connection between culture/structure, doctoral degree experiences, & doctoral degree progress

1) Thinking back to what we have discussed about your past and current doctoral experiences, are there aspects of your doctoral program's culture or structure that are especially helpful for your degree progress? Which aspects, and how?
   a. Probe: What aspects of the institution or departmental environment have been particular helpful for facilitating doctoral degree completion?

2) Thinking back to what we have discussed about your past and current doctoral experiences, are there aspects of your doctoral program's culture or structure that challenge or undermine your doctoral degree progress or the likelihood of completing your degree? Which ones and how?
   a. Probe: If so, do you think these cultural or structural barriers that you have described such as [name aspects described] have anything to do with being a woman? Do you think these challenging aspects in your doctoral degree program or department are experienced differently by women?

Role of Gender

3) Were there any times during your doctoral experience where you were particularly aware that being a woman mattered to your doctoral degree experience? If so, can you please provide an example or two?

4A) Engineering only: The field of Engineering is one in which women are often underrepresented as both students and faculty. What has the doctoral experience been

like for you as a woman doctoral student in a field where there are mostly men as faculty, students, and Engineers?

4B) Education only: The field of Education is one in which women are often overrepresented as both students and faculty. What has the doctoral experience been like for you as a woman doctoral student in a field where there are mostly women as faculty, students, and educators?

5A) Engineering only: Some people would argue that because Engineering doctoral programs are dominated by men (both as students and faculty), Engineering must not provide a very supportive environment for women. What would you say to them? Do you agree or disagree with this assumption based on your own experiences?

5B) Education only: Some people would argue that because Education doctoral programs are dominated by women (both as students and faculty), Education must provide a supportive environment for women. What would you say to them? Do you agree or disagree with this assumption based on your own experiences?

Degree Progress

6) Has your degree pursuit been continuous throughout your experience, or have you experienced interruptions? If there were interruptions, what interruptions did you experience?

7) Thinking ahead, what is your plan for completing your doctoral degree?
    a. Probe: when do you think you will finish?

8) Have you ever experienced any doubt or second-guessed your decision to pursue a doctoral degree? If so, why? What in particular in your doctoral experience has affected your degree progress?

9) What do you want to do after you complete your doctorate in Engineering/Education?

10) Is there anything else that you think I should know about the culture of doctoral education, your doctoral experiences, or your doctoral degree progress?

End Interview

Thank the participants for their time and for sharing their stories over the course of the study. ***Give the participant the final installment ($25 Gift card) for participating in the final interview.*** Inform each individual doctoral student participant that I will be writing a 3-4 page biographical summary based on the three individual interviews I conducted and that I plan to share this summary with her prior to beginning data analysis to check for accuracy and understanding of each individual participant's doctoral experience.

Appendix D: Focus Group Protocol

1. Invite women to help themselves to food and beverages provided during the focus group
2. Check the recording equipment for proper functioning before the interview
3. Introduce myself to the doctoral student group, thank them for volunteering to participate, and explain the purpose of the focus group interview.
4. Review the informed consent form which has been approved by Boston College's human subject review board.
5. Obtain the participant's signature on 2 copies of the consent form (1 copy for researcher, 1 copy for participant)
6. Explain the focus group process
    a. *The purpose of this interview is to learn about the culture and social structure of your doctoral programs in Engineering/Education at your institution. You do not have to answer a question if you do not feel comfortable doing so, and you are free to leave the focus group if you feel uncomfortable or do not wish to continue.*
    b. *This focus group session should last no longer than 60 minutes.*
7. Explain the recording process
    a. *To facilitate data collection, I would like to digitally record our conversation today. I am the only one who will have access to these records, which will be stored in a secure file until they are transcribed. Once the focus group interview is transcribed, the original audio files will be destroyed. May I have your permission to record?*
8. Begin recording

Interviewee Names & Pseudonyms:

Focus Group Interview Date:

Thank you all for meeting with me today. The questions for this interview will focus on two major areas. First, I will ask you about the culture and structure of doctoral education in Engineering/Education as it exists within your doctoral program at [this institution]. Second, I will ask about the most salient institutional supports and barriers to your progression through doctoral study thus far.

Note: Since this is a semi-structured interview, the following questions will be used as a guide only. Some questions may not be asked if the participants answer them in previous responses. The interviewer will follow-up with additional questions based on the context of each interview to probe for more detail or clarification if the interviewer believes it is necessary.

Questions:

Culture & Social Structure

1) If you had to describe your doctoral program to a friend or family member, what would you tell them?
   a. Probe: What is expected of doctoral students in Engineering/Education at [this institution]?

2) What words would you use to characterize doctoral education in Engineering/Education at [this institution]?
   a. Probe: What is the Engineering/Education doctoral student culture like at [this institution]?
   b. Probe: What are the faculty like in Engineering/Education at [this institution]?
   c. What does the department and institution seem to value or emphasize to doctoral students?

3) What words would you use to characterize Engineering/Education as a field? What do you think are the beliefs and values of the Engineering/Education profession?

Institutional Supports & Barriers

Now I want to focus on the institutional supports and barriers that you have experienced while enrolled in doctoral study in Engineering/Education.

4) What has helped your progress as a doctoral student in your Engineering/Education doctoral degree program?
   a. Follow-up: How did you learn about and access these support mechanisms?

5) What factors have challenged you in your doctoral degree program?
    a. Follow-up: Have others experienced these same challenges?

6) What are some of the issues facing women doctoral students in Engineering/Education today?
    a. Probe: What are some of the issues that you discuss with your student peers that you may feel uncomfortable discussing with faculty or your advisor?

7) **Engineering only**: Some people would argue that because Engineering doctoral programs are dominated by men (both as students and faculty), Engineering must provide an unsupportive environment for women. What would you say to them? Do you agree or disagree with this assumption based on your own experiences?

8) **Education only**: Some people would argue that because Education doctoral programs are dominated by women (both as students and faculty), Education must provide a supportive environment for women. What would you say to them? Do you agree or disagree with this assumption based on your own experiences?

Suggestions for Change:

9) If you could, what would you change about your doctoral program, department, or institution?

10) What would you keep or not change about your doctoral program, department, or institution?

End Interview:

Thank participants for their time and insights, and ask them to help themselves to the remainder of the complimentary food and beverages. Remind the participant that I will be contacting her to schedule the final individual interview within the next two weeks. ***I will inform the participants that they will receive their final installment of $25 at the conclusion of the final individual interview.***

Appendix E: **Participant Eligibility Survey**

1. Are you a female? Yes No
2. [Engineering Only] Are you currently enrolled in a doctoral program in Engineering at NIES? Yes No
3. [Education Only] Are you currently enrolled in a doctoral program in Education at NUES? Yes No
4. Doctoral Degree Program Name:
5. At which phase are you currently in your doctoral program? (mark only one)
    a. Completing 1st year of coursework
    b. Completing 2nd year of coursework
    c. Completing 3rd year of coursework
    d. Studying for/taking/completing comprehensive/qualifying exams
    e. Dissertation/thesis stage (admitted to doctoral candidacy)
6. Are you enrolled full-time or part-time, as defined by your institution? (mark only one)
    a. Full-time student
    b. Part-time student
7. If you are interested in participating in this study, please provide your contact information so that the researcher may contact you with more details about your participation:
    a. Name:
    b. Email:
    c. Phone #:

Appendix F: Participant Demographic Information Form

Student Name:

Student Email:

Student Phone #:

Doctoral Degree Program: _____

Department Name: _____

Semester & year you began doctoral study (e.g. Fall 2010): _____

Current Phase in Doctoral Program (circle only one):

A) Second year coursework
B) Third year coursework
C) Studying for/taking/completing Comprehensive/Qualifying Examination
D) Dissertation Phase (admitted to doctoral candidacy)

Anticipated Graduation Date: (Semester & Year): _____

Current Age:

A) 21- 25
B) 26 – 30
C) 31 – 35
D) 36 – 40
E) 41 – 50
F) 51- 60
G) 61 or older

Race/Ethnicity:

- ❑ American Indian or other Native American
- ❑ Asian, Asian American, or Pacific Islander
- ❑ Black or African American
- ❑ White, Non-Hispanic
- ❑ Mexican or Mexican American
- ❑ Puerto Rican
- ❑ Other Hispanic or Latino
- ❑ Multi-racial
- ❑ Other: _____
- ❑ I prefer not to respond

Citizenship:

A. I am a United States Citizen or Permanent Resident
B. I am not a citizen of the United States (I have a student visa)

Sexual Orientation:

A) Gay/Lesbian/Bisexual/Transgender
B) Straight
C) I prefer not to respond

Marital Status:

A) Single
B) Married
C) Divorced
D) "Marriage-like"/Co-habiting relationship

Children: Do you have children? (If currently pregnant, select Yes): Yes No

A) If you have children, how many? _____

B) Are any of your children under the age of 18?**:** Yes No